Upton
Fuller

# ARITHMETIC

Grade 6

## THE 100 ADDITION FACTS

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |

## THE 100 SUBTRACTION FACTS

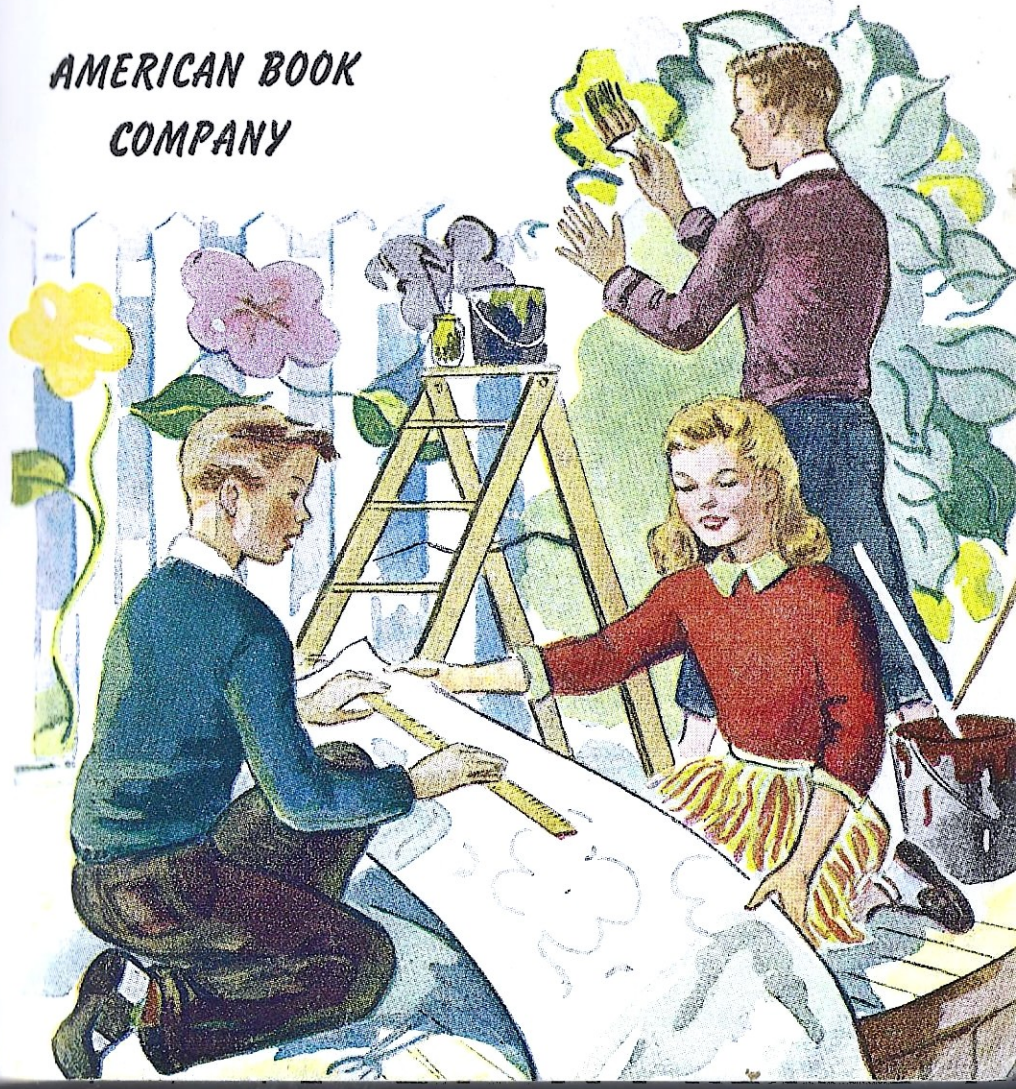
| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
| 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 |
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
| 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
| 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 |
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |

Clifford B. Upton and Kenneth G. Fuller

# ARITHMETIC

## Grade Six

AMERICAN BOOK
COMPANY



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# Introduction

The meaning theory of teaching arithmetic is the philosophy underlying the writing of these books. According to this theory, arithmetic should be so taught that the pupils understand it. This means clear and simple explanations of the fundamental processes of arithmetic, it means emphasis upon basic principles rather than mechanical rules, it means an understanding of our number system, it means rich motivation of all new processes in terms of pupils' interests, it means a wealth of real problems and projects, and finally it means enough exercises on each topic so that principles and concepts become meaningful through adequate practice in their use. This effective combination of principles and practice is found on every page of this series of arithmetics. And it is only through such a program of instruction that pupils can develop the ability to solve problems and to compute with ease and understanding.

The basic number facts are carefully reviewed in this book since pupils can have no success in arithmetic until they have automatic mastery of all the 390 facts. For those pupils who have difficulty in remembering the harder multiplication and division facts, special helps are provided to aid in remedying such defects as may exist.

The carefully planned instruction in problem solving, which was given in the preceding grades, is continued in this book. In addition to many one-step problems, representing all the types of quantitative thought that are possible in connection with the four processes, special attention is now given to the solution of problems of two or more steps. Many challenging

problems are distributed throughout the text. In addition, there is a liberal number of interesting projects in which arithmetic is integrated with other subjects such as history, geography, science, agriculture, and transportation.

A problem test made up of important types of problems with which the pupil should be familiar is included in each chapter. These tests serve to measure the pupil's ability in problem solving.

Long division with two-figure divisors, which was taught in the preceding grade, is reviewed in this grade and extended to include three-figure divisors for the first time. All this work on long division is taught by methods which give the correct quotient figure on first trial in 80 per cent of all cases. In the remaining 20 per cent of the cases, the correct quotient figure is found, with minor exceptions, after a single correction of the trial quotient figure. The procedures so often found in schoolrooms, by which the pupil tries first one quotient figure and then another until he finds the correct one, is thus avoided.

The addition and subtraction of fractions are reviewed and supplemented with exercises involving more difficult common denominators. The multiplication and division of fractions by fractions, the use of cancellation in computing with fractions, and the ratio concept of fractions are all presented for the first time in this grade.

The four operations with decimals are thoroughly taught, this work being limited, in general, to numbers having three decimal places. Frequent applications are made of the decimal division of our units of measure such as the inch, the foot, the mile, and the pound. In connection with the study of decimals, the rounding off of results is explained.

An introductory treatment of percentage, with applications to everyday affairs, is included. This work is restricted to the finding of a given per cent of a number.



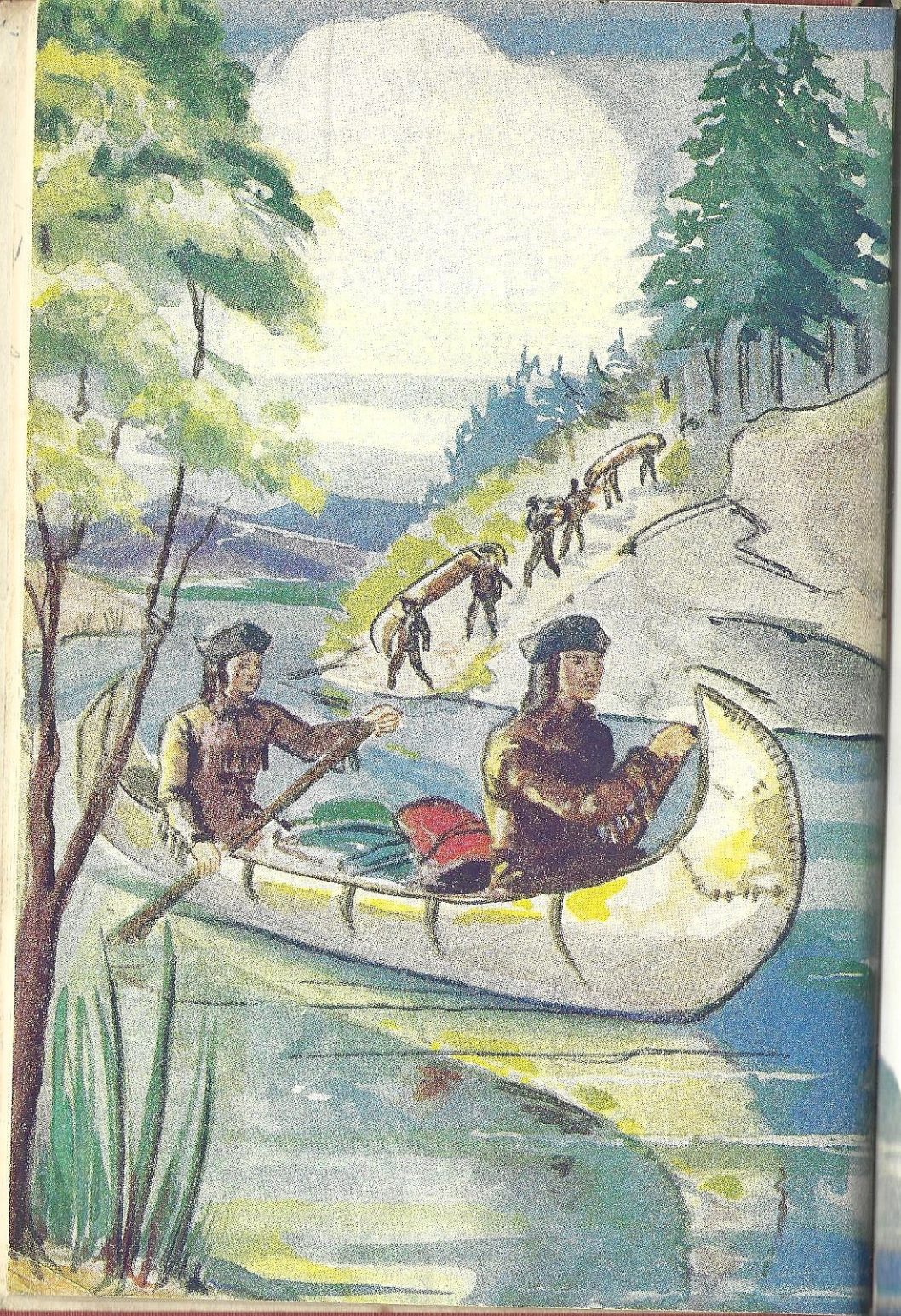
The explanations of the fundamental processes are given in simple language that the pupils can understand. Great care has been taken to avoid overexplanation and the confusion that it causes. The vocabulary has been carefully selected and contains an unusually high percentage of words recognized in authoritative word lists as suitable for the sixth grade and below.

A generous number of carefully graded abstract exercises is distributed throughout the book. These exercises are scientifically constructed to provide drill on all the basic number facts.

A series of 63 Improvement Tests covering the four operations with whole numbers is included in this book. These tests are distributed over the year's work and provide a most efficient and interesting means of perfecting computational skills already learned while the pupil is studying new topics.

To assure efficient learning the pupil's progress is frequently checked by reviews, summaries, and tests. There is also a comprehensive program of diagnostic tests covering whole numbers, fractions, and decimals, with keyed references to many remedial exercises.

The authors wish to acknowledge their indebtedness to Dr. Ethel Sutherland, to Miss Margaret Uhlinger, and to Mrs. Siegried M. Upton for their many valuable contributions to this book.



CHAPTER ONE

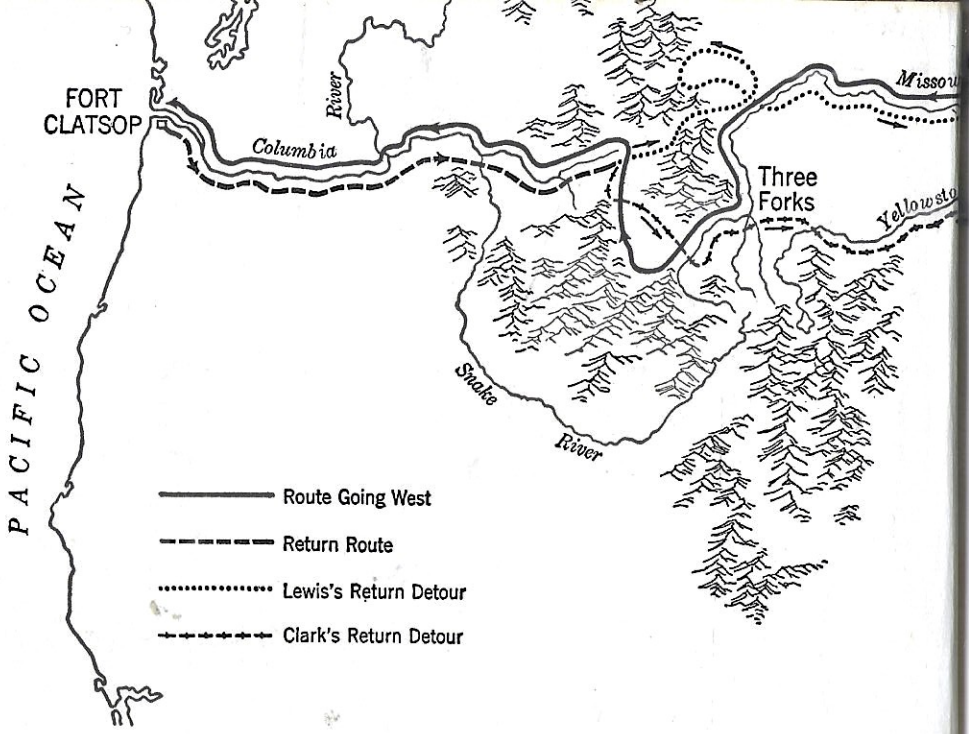
# Working with Whole Numbers

## LEWIS AND CLARK EXPEDITION

When Thomas Jefferson was President of the United States, he sent out an expedition commanded by Meriwether Lewis and William Clark with orders to go up the Missouri River to its source and continue west to the Pacific Ocean. The object of this exploration was to establish a fur trade with the Indians and to study the possibilities of this region for new settlers.

**1.** Congress voted $2500 to cover the cost of supplies for the expedition. Of this amount $\frac{1}{4}$ was to be spent for red coats, bright colored handkerchiefs, tomahawks, knives, looking glasses, flags, and beads as gifts for the Indians. How much money was to be spent on Indian gifts?

**2.** Lewis and Clark left St. Louis May 14, 1804, and started up the Missouri River. On October 31 they reached a place near what is now Bismarck, North Dakota. They built a camp there, called Fort Mandan, where they spent the winter. How many days did the trip to Fort Mandan take? To find the number of days, think: "After May 14, there are 17 days left in May. There are 30 days in June, 31 in July, 31 in August, 30 in September, and 31 in October." Add these numbers to find the number of days. The distance from St. Louis to Fort Mandan was 1600 mi. Did the party travel about 9 mi. a day or about $9\frac{1}{2}$ mi. a day? Multiply 170 by 9; then multiply 170 by $9\frac{1}{2}$ and see which answer is closer to 1600. See the map on pages 2 and 3.



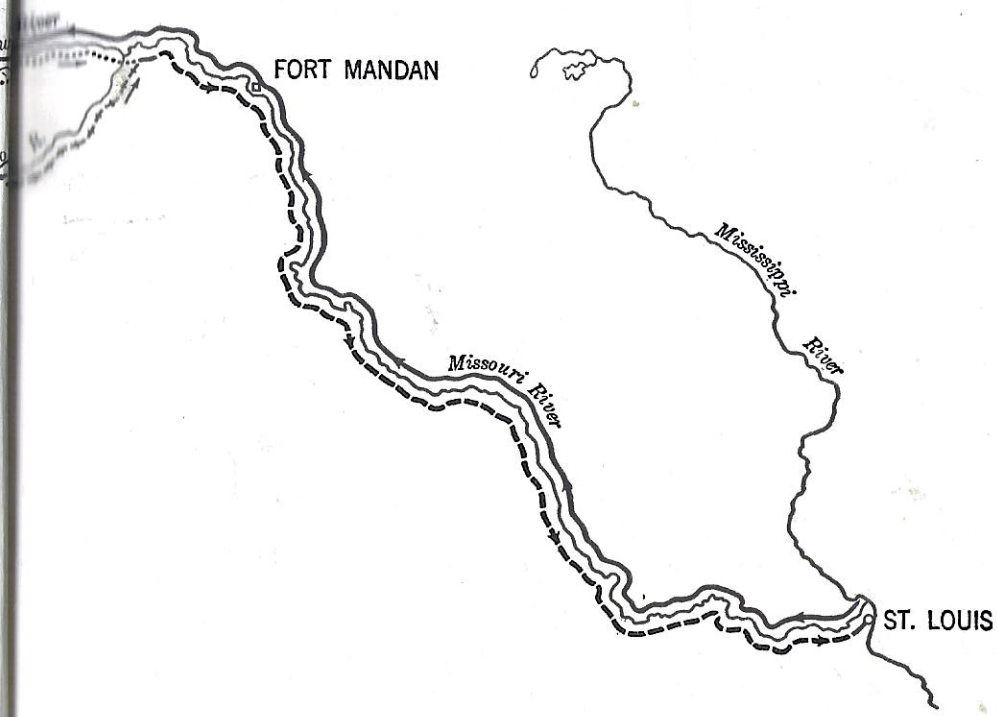

## LEWIS AND CLARK EXPEDITION

1. After spending the winter at Fort Mandan, Lewis and Clark left the Fort on April 7, 1805, and continued their trip up the Missouri River to a place called Three Forks where the Missouri proper begins. They arrived there on July 25. How many days did the trip take? See the map above.

2. The men then crossed the Rocky Mountains and continued west until they came to the Columbia River. On October 16 they started down the Columbia in canoes and reached the Pacific Ocean on November 7, 1805, where they built a camp called Fort Clatsop in which they spent the winter. How many days did the Columbia River trip take? How many miles per day did they average on the trip down the Columbia if the distance was 413 mi.?

3. The trip from Fort Mandan to Fort Clatsop took a total of 214 days and covered 2534 mi. Was the speed of travel on






this trip about 11 mi. a day or about 12 mi. a day? In ex. 2 on page 1, you are told that the men traveled 1600 mi. in going from St. Louis to Fort Mandan. How many miles in all did they travel on the complete trip across the country from St. Louis to Fort Clatsop?

4. The men remained at Fort Clatsop for 136 days during a winter of much misery caused by shortage of food and bad weather. While they were there it rained 116 days. How many days were without rain?

5. Lewis and Clark left Fort Clatsop on March 23, 1806, and began the long journey back to St. Louis. When they reached the Rocky Mountains they stopped at Travelers' Rest where the expedition divided into two groups; Lewis and his group went northeast while Clark's party headed toward the Yellowstone River. The trip from Fort Clatsop to Travelers' Rest took 100 days. On what date did they arrive at Travelers' Rest?

1. When Clark's party reached the Yellowstone River, they started down the valley of the river on horseback. It took them 4 days to travel 96 mi. This was too slow so they built canoes and rode downstream on the Yellowstone to its mouth where the Yellowstone joins the Missouri. The canoe trip on the Yellowstone covered 638 mi. and took 11 days. Find the average daily rate of travel by horseback. Find the average daily rate by canoe. Did they do better by canoe?

2. On the return trip Clark's party saw many wild animals. In four days they killed 43 deer, 14 bighorn sheep, 16 elk, 4 buffaloes, and 2 beavers. How many animals in all did they kill in the four days?

3. At the mouth of the Yellowstone, Clark rejoined Lewis and his party and they remained together for the rest of the trip home. They left the mouth of the Yellowstone on August 3, 1806, and went down the Missouri 1880 mi. to St. Louis where they arrived on September 23. How many days did this trip take? What was their average speed per day?

4. At the end of the trip Lewis and Clark said that they had traveled about 8000 mi. in all on the round trip from St. Louis to the Pacific and back. On the trip from St. Louis to the Pacific, they covered 4134 mi. About how many miles did they travel on the return trip from the Pacific to St. Louis?

5. It was on May 14, 1804, that Lewis and Clark first left St. Louis for the long trip westward. They arrived back in St. Louis on September 23, 1806. How many years, months, and days had they been away?

6. When they arrived in St. Louis there were 33 men of the party who had been on the complete round trip. As an extra reward to these men, the Government told them that each man could put in a claim for 320 acres of land in the Louisiana Territory. Find the total number of acres of land the Government was ready to give these men.



1. In a recent year about 39,000,000,000 eggs were produced in the United States; 39,000,000,000 is read 39 *billion.*

2. This same year Iowa produced 2,566,000,000 eggs, making the best state record. 2,566,000,000 is read 2 *billion,* 566 *million.*

3. Numbers containing 10, 11, or 12 figures stand for *billions.* You see from the numbers above that the figures are separated by commas into groups of 3 figures each, beginning at the right. Billions is the fourth period counting from the right. Here are the names of the periods:

| Billions | Millions | Thousands | Ones |
|---|---|---|---|
| 153, | 274, | 860, | 943 |

This number is 153 *billion,* 274 *million,* 860 *thousand,* 943.

4. The number of eggs produced one year in certain states is given below. Read these numbers:

| State | Number of Eggs | State | Number of Eggs |
|---|---|---|---|
| Ohio | 2,250,500,000 | Virginia | 960,500,000 |
| Texas | 2,139,800,000 | California | 1,810,300,000 |
| Illinois | 1,924,750,000 | Missouri | 1,964,050,000 |
| New York | 1,820,080,000 | Minnesota | 1,886,100,000 |

5. In each number put commas in the right places to separate the number into periods: 6289194006; 137284074916; 428200634; 92437062250; 1138467805.

Write these numbers:

6. Fifteen billion, twenty million, seven thousand, forty.

7. Three billion, eight hundred twenty-four million, sixteen thousand, five hundred.

8. Two hundred eighty billion, four hundred sixty million, six hundred.

9. Six billion, seven hundred fifty million, twenty-two thousand, two hundred eleven.

This is a test on the addition facts. You should be able to give all the sums orally within the time stated by the teacher. Make a list of any facts that give you trouble and practice on them:

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 1. | 2 | 3 | 5 | 8 | 4 | 1 | 3 | 9 | 2 | 1 |
| | 1 | 7 | 0 | 2 | 4 | 6 | 2 | 3 | 0 | 3 |
| 2. | 4 | 0 | 5 | 6 | 1 | 5 | 7 | 6 | 4 | 2 |
| | 8 | 3 | 6 | 4 | 8 | 9 | 0 | 8 | 1 | 2 |
| 3. | 4 | 1 | 0 | 2 | 3 | 5 | 1 | 2 | 7 | 8 |
| | 2 | 9 | 4 | 3 | 5 | 7 | 2 | 9 | 9 | 0 |
| 4. | 6 | 6 | 2 | 8 | 1 | 6 | 2 | 0 | 5 | 4 |
| | 9 | 1 | 6 | 3 | 0 | 3 | 8 | 6 | 2 | 7 |
| 5. | 5 | 8 | 9 | 0 | 4 | 3 | 8 | 4 | 6 | 3 |
| | 3 | 4 | 8 | 8 | 5 | 1 | 5 | 0 | 5 | 9 |
| 6. | 7 | 6 | 3 | 7 | 4 | 1 | 7 | 8 | 0 | 8 |
| | 6 | 0 | 4 | 2 | 9 | 4 | 1 | 6 | 9 | 9 |
| 7. | 9 | 4 | 3 | 0 | 2 | 1 | 6 | 3 | 7 | 9 |
| | 1 | 6 | 8 | 0 | 4 | 5 | 6 | 6 | 4 | 5 |
| 8. | 5 | 9 | 7 | 9 | 2 | 8 | 9 | 1 | 3 | 7 |
| | 8 | 0 | 8 | 4 | 7 | 8 | 2 | 1 | 0 | 7 |
| 9. | 0 | 5 | 9 | 4 | 7 | 0 | 9 | 5 | 9 | 7 |
| | 2 | 1 | 9 | 3 | 5 | 7 | 6 | 5 | 7 | 3 |
| 10. | 8 | 6 | 0 | 5 | 1 | 3 | 2 | 0 | 8 | 6 |
| | 1 | 7 | 5 | 4 | 7 | 3 | 5 | 1 | 7 | 2 |

To the Teacher: See the suggestions on page 308.



Exercises 1 to 12 will help you to do good work in column addition. See how quickly you can give the answers.

1. Count by 3's from 4 to 55; by 4's from 3 to 63.
2. Count by 6's from 5 to 65; by 7's from 2 to 72.
3. Count by 8's from 4 to 76; by 9's from 5 to 86.

Add 5 to each number. Do the work mentally:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 4. | 34 | 76 | 29 | 82 | 63 | 91 | 48 | 55 |
| 5. | 92 | 18 | 35 | 49 | 56 | 28 | 83 | 77 |
| 6. | 78 | 36 | 51 | 27 | 19 | 93 | 65 | 84 |
| 7. | 43 | 85 | 94 | 66 | 37 | 79 | 52 | 17 |

8. Add 7 to each number in ex. 4 to 7. Add 6; add 8.

Do the work mentally:

| | | | | | |
|---|---|---|---|---|---|
| 9. | 19 + 8 | 25 + 7 | 34 + 9 | 86 + 6 | 49 + 7 |
| 10. | 45 + 6 | 59 + 3 | 27 + 4 | 64 + 8 | 95 + 8 |
| 11. | 77 + 3 | 34 + 6 | 88 + 9 | 47 + 6 | 56 + 9 |
| 12. | 31 + 9 | 78 + 2 | 59 + 9 | 43 + 7 | 67 + 5 |

Add up. Check the work by adding down. Write the answers on folded paper:

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 13. | 7 | 3 | 4 | 3 | 2 | 2 | 5 | 8 | 4 |
| | 6 | 8 | 2 | 1 | 4 | 4 | 2 | 2 | 8 |
| | 5 | 4 | 9 | 6 | 5 | 8 | 9 | 7 | 5 |
| | 9 | 7 | 3 | 9 | 8 | 5 | 3 | 4 | 7 |
| | 3 | 5 | 8 | 4 | 6 | 9 | 8 | 6 | 9 |
| | 8 | 9 | 6 | 5 | 3 | 4 | 7 | 3 | 2 |

14. It is important to understand the language of arithmetic. In an addition problem, the numbers that are added are called *addends;* the answer is the *sum.*

$$\left.\begin{array}{r}345\\172\end{array}\right\}\text{Addends}$$
$$\underline{517}\ \text{Sum}$$

To the Teacher: For use of folded paper, see page 50.

## ADDITION PRACTICE

Copy, add, and check:

1. \$15.16 + \$8.49 + \$2.05 + \$3.97 + \$10.50 + \$3.15
2. \$7.87 + \$24.65 + \$13.24 + \$8.53 + \$1.98 + \$12.46
3. \$3.63 + \$35.79 + \$4.44 + \$11.45 + \$18.75 + \$3.20
4. \$36.93 + \$8.29 + \$5.56 + \$12.72 + \$46.60 + \$7.38

Add up. Check by adding down:

| | | | | | | |
|---|---|---|---|---|---|---|
| 5. | 89 | 45 | 97 | 85 | 46 | 94 |
| | 98 | 97 | 80 | 36 | 25 | 37 |
| | 72 | 81 | 14 | 47 | 67 | 75 |
| | 33 | 23 | 39 | 52 | 36 | 56 |
| 6. | 21 | 35 | 41 | 65 | 24 | 41 |
| | 23 | 68 | 86 | 46 | 36 | 27 |
| | 58 | 71 | 75 | 83 | 67 | 78 |
| | 32 | 23 | 14 | 14 | 53 | 52 |
| | 85 | 46 | 32 | 51 | 53 | 34 |
| 7. | 60 | 36 | 93 | 14 | 70 | 36 |
| | 79 | 91 | 26 | 46 | 49 | 45 |
| | 56 | 49 | 54 | 23 | 23 | 81 |
| | 45 | 35 | 89 | 81 | 97 | 55 |
| | 28 | 28 | 61 | 98 | 18 | 93 |
| | 33 | 52 | 22 | 35 | 31 | 27 |
| 8. | 371 | 759 | 264 | 116 | 412 | 323 |
| | 287 | 562 | 323 | 532 | 484 | 977 |
| | 945 | 275 | 586 | 897 | 879 | 819 |
| | 178 | 698 | 937 | 324 | 545 | 181 |
| | 419 | 146 | 425 | 605 | 763 | 268 |
| 9. | 215 | 234 | 533 | 582 | 254 | 623 |
| | 197 | 758 | 488 | 346 | 316 | 830 |
| | 323 | 525 | 744 | 673 | 775 | 282 |
| | 478 | 776 | 625 | 959 | 430 | 399 |
| | 661 | 312 | 161 | 264 | 898 | 468 |
| | 652 | 469 | 277 | 124 | 417 | 509 |



This is a test on the subtraction facts. You should be able to give all the answers orally within the time stated by the teacher. Make a list of any facts that give you trouble and practice on them:

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 1. | 9 | 7 | 12 | 10 | 16 | 13 | 15 | 9 | 13 | 9 |
| | 9 | 6 | 3 | 6 | 8 | 6 | 9 | 7 | 8 | 4 |
| 2. | 16 | 6 | 10 | 3 | 14 | 11 | 5 | 8 | 5 | 14 |
| | 9 | 2 | 8 | 0 | 7 | 2 | 5 | 0 | 2 | 6 |
| 3. | 12 | 7 | 13 | 9 | 11 | 12 | 11 | 17 | 8 | 5 |
| | 7 | 0 | 9 | 2 | 8 | 6 | 7 | 8 | 6 | 1 |
| 4. | 7 | 9 | 11 | 15 | 4 | 14 | 8 | 10 | 12 | 4 |
| | 5 | 1 | 6 | 6 | 3 | 8 | 5 | 3 | 9 | 4 |
| 5. | 9 | 11 | 5 | 7 | 8 | 10 | 2 | 9 | 6 | 1 |
| | 6 | 9 | 0 | 7 | 2 | 1 | 0 | 8 | 5 | 0 |
| 6. | 13 | 7 | 18 | 2 | 13 | 6 | 12 | 6 | 14 | 2 |
| | 5 | 1 | 9 | 1 | 7 | 4 | 4 | 0 | 5 | 2 |
| 7. | 3 | 1 | 7 | 11 | 8 | 5 | 15 | 10 | 4 | 0 |
| | 1 | 1 | 3 | 3 | 8 | 4 | 8 | 5 | 1 | 0 |
| 8. | 16 | 11 | 8 | 12 | 13 | 6 | 9 | 3 | 10 | 6 |
| | 7 | 4 | 7 | 5 | 4 | 1 | 5 | 2 | 9 | 3 |
| 9. | 7 | 5 | 9 | 8 | 11 | 3 | 17 | 4 | 9 | 10 |
| | 4 | 3 | 0 | 3 | 5 | 3 | 9 | 2 | 3 | 7 |
| 10. | 15 | 10 | 14 | 6 | 8 | 10 | 8 | 12 | 4 | 7 |
| | 7 | 4 | 9 | 6 | 4 | 2 | 1 | 8 | 0 | 2 |

To THE TEACHER: See the suggestions on page 308.

1. If you forget the answer to a subtraction fact, you can get it easily as shown here. For example, if you forget what 7 from 15 equals, think "7 and what make 15?" If you remember that 7 and 8 are 15, then 7 from 15 is 8.

2. If you forget what 9 from 13 equals, think "9 and what are 13?" Since 9 and 4 are 13, this shows that 9 from 13 is 4. How should you think if you forget the answer to 8 from 12? to 6 from 14? to 8 from 17? to 5 from 13?

3. In a subtraction example, the number from which you subtract is called the *minuend*, the number which you subtract is called the *subtrahend*, and the answer is called the *remainder*, or the *difference*.

| | |
|---|---|
| 3200 | Minuend |
| 2807 | Subtrahend |
| 393 | Remainder |

To check a subtraction example, add the remainder to the subtrahend, adding up. The result should equal the minuend.

Subtract and check. Write the answers on folded paper:

| | | | | | |
|---|---|---|---|---|---|
| 4. | 5804 − 2479 | 1897 − 1145 | 4000 − 2146 | 56921 − 42542 | 46362 − 24758 |
| 5. | 7512 − 2044 | 9176 − 4768 | 8359 − 2472 | 14317 − 4531 | 81468 − 63689 |
| 6. | 1392 − 967 | 6535 − 1482 | 1724 − 726 | 15715 − 9386 | 10000 − 5204 |
| 7. | 1000 − 369 | 8358 − 3386 | 4981 − 2316 | 59194 − 46648 | 17638 − 8653 |
| 8. | 6614 − 3767 | 1222 − 468 | 6836 − 2475 | 70000 − 31877 | 47163 − 32389 |

9. Take $77.78 from $159.75.

10. How much less than 20,000 is 16,255?

11. How much more is 45,459 than 40,536?



1. Last summer Ann's father took his family on a trip. It cost $53.85 for travel expenses, $72.90 for meals and rooms, and $15.25 for other things. Find the average cost of the trip for each of the 4 persons.

2. Jack's father sent Jack to the bank to get change for $10.00. He wanted three dollars' worth of nickels, three dollars' worth of dimes, two dollars' worth of quarters, and two dollars' worth of half dollars. How many coins of each kind did Jack get?

3. Peter says his grandfather was born 69 years ago today. In what year was Peter's grandfather born?

4. Mrs. Wilson made 283 sugar cookies. She wrapped them in packages of 8 cookies each. How many full packages did she have? Were any cookies left over?

5. Mrs. Wilson sold the packages of cookies to a store at 20¢ a package. How much did she get for them?

6. When Tom's older brother starts football practice in September, Tom also practices with the boys in his grade. Tom bought a helmet for $1.59 and shoulder pads for $1.59. How much in all did he pay for them?

7. Tom has a cheap football but he wants a better one that costs $1.79 and football shoes that cost $2.98. Can he buy both of these if he saves $5.00?

1. The 100 multiplication facts are like the 100 addition facts on page 6 except that you multiply the numbers instead of adding them. Turn to page 6 and try to *multiply* all the numbers on that page orally within the time stated by the teacher. Give the answers only.

2. In multiplication the number that you multiply is the *multiplicand*, the number by which you multiply is the *multiplier*, and the answer is the *product*.

| | |
|---|---|
| 317 | Multiplicand |
| 4 | Multiplier |
| 1268 | Product |

Do these mentally. Give only the answers:

3. $3 \times 9 + 2$ $\quad 7 \times 5 + 6$ $\quad 5 \times 9 + 4$ $\quad 5 \times 7 + 4$
4. $5 \times 6 + 3$ $\quad 4 \times 7 + 3$ $\quad 8 \times 8 + 7$ $\quad 7 \times 8 + 5$
5. $7 \times 7 + 4$ $\quad 3 \times 8 + 6$ $\quad 7 \times 4 + 3$ $\quad 9 \times 9 + 4$
6. Multiply each number by 9 and add 5 to the product:
   4 7 5 9 2 6 8 0 3
7. Multiply each number in ex. 6 by 8 and add 6.
8. Multiply each number below by 36; by 70; by 850:
   75 24 38 49 607 219 546

Multiply. Check the work by going over it:

| | | | | | | |
|---|---|---|---|---|---|---|
| 9. | 739<br>465 | 408<br>327 | 526<br>408 | 3219<br>19 | 6482<br>56 | $57.39<br>27 |
| 10. | 846<br>395 | 261<br>437 | 384<br>184 | 1729<br>58 | 7059<br>93 | $12.65<br>62 |
| 11. | 517<br>295 | 726<br>374 | 458<br>486 | 3816<br>79 | 5319<br>38 | $31.79<br>76 |
| 12. | 450<br>547 | 498<br>246 | 924<br>359 | 7362<br>24 | 3856<br>61 | $24.57<br>37 |



1. Jane earned $10.00 last summer. She wants to buy a sweater and skirt, which together cost $6.49. How much money will she have left?

2. One week Jack rode his bicycle a total distance of 84 mi. How many miles per day did he average?

3. Tom sold 12 doz. ears of sweet corn from his garden for $.35 a dozen. How much did he get for the corn?

4. Bill kept a record of the money he received from the sale of vegetables from his garden. He received $1.50 for sweet corn, $1.60 for carrots, $.45 for lettuce, $.95 for beets, and $.60 for radishes. How much money did Bill receive?

5. Mary paid 25¢ a day to go in the swimming pool. How much did it cost her for 15 days?

6. Dick earned $25.40 mowing lawns for the neighbors. He saved this toward a bicycle. The bicycle he wants costs $32.95. How much more money does Dick need to save to have enough to buy the bicycle?

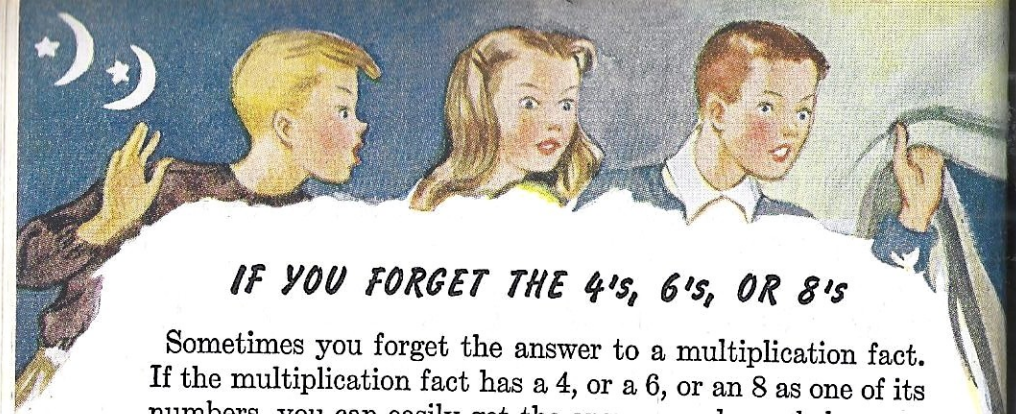
7. Mr. Bates bought a new automobile which cost $1250. He was allowed $375 for the old car. How much money did Mr. Bates have to pay for the new car?

8. Sally gave the milkman $10.00 to pay the milk bill. How much change should she get if the bill was $7.35?

9. George's father sold 4 crates of eggs one week. If there are 30 doz., or 360 eggs, in one crate, how many eggs did George's father sell that week?

10. At the end of the summer Grace paid $3.35 for a pair of shoes. This was $1.25 less than they were marked at the beginning of the summer. What was the price of the shoes at the beginning of the summer?

11. The distance from Flint to Blue Lake is 345 mi. The distance from Flint to Long Lake is 278 mi. How many miles farther is it to Blue Lake than to Long Lake?



## IF YOU FORGET THE 4's, 6's, OR 8's

Sometimes you forget the answer to a multiplication fact. If the multiplication fact has a 4, or a 6, or an 8 as one of its numbers, you can easily get the answer as shown below.

1. If you forget the answer to $4 \times 9$, take $\frac{1}{2}$ of 4 which is 2. Then find the answer for $2 \times 9$ and double it. Think "$2 \times 9 = 18$, $2 \times 18 = 36$. So $4 \times 9 = 36$." Do the work in your head.

2. Show how to get the answer if you forget $4 \times 7$; $5 \times 4$; $9 \times 4$. In each case begin by taking $\frac{1}{2}$ of 4.

3. If you forget the answer to $6 \times 7$, take $\frac{1}{2}$ of 6 which is 3. Then find the answer for $3 \times 7$ and double it. Think "$3 \times 7 = 21$, $2 \times 21 = 42$. So $6 \times 7 = 42$."

4. Show how to get the answer if you forget $6 \times 5$; $6 \times 9$; $7 \times 6$; $3 \times 6$. In each case begin by taking $\frac{1}{2}$ of 6.

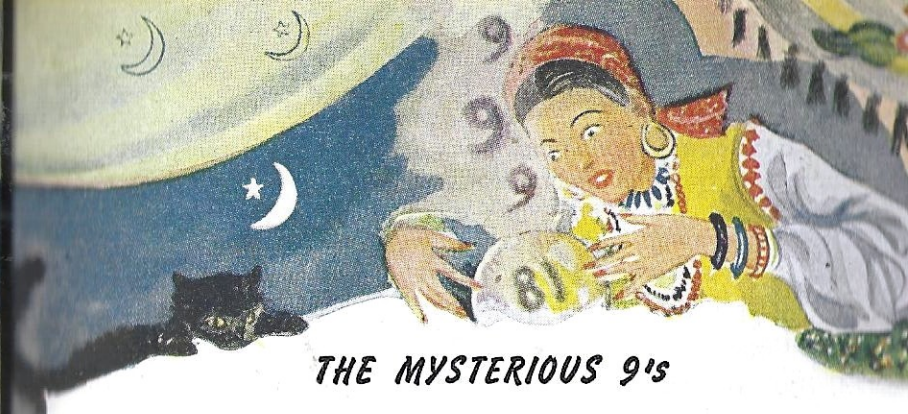
5. If you forget the answer to $8 \times 7$, take $\frac{1}{2}$ of 8 which is 4. Then find the answer for $4 \times 7$ and double it. Think "$4 \times 7 = 28$, $2 \times 28 = 56$. So $8 \times 7 = 56$." A still quicker way to think is like this: "28, 56. $8 \times 7 = 56$."

6. Suppose you forget the answer to $6 \times 8$. This fact has both a 6 and an 8. In this case take $\frac{1}{2}$ of *one* of the numbers. If you take $\frac{1}{2}$ of 6, you get 3. Then find $3 \times 8$ which is 24. Double 24 which is 48. So $6 \times 8 = 48$. You can also get the same answer by taking $\frac{1}{2}$ of 8 which is 4. Then find $6 \times 4$ which is 24. Double 24 which is 48. So $6 \times 8 = 48$.

Suppose you forget these facts. Find the answers as shown above:

| | | | | |
|---|---|---|---|---|
| 7. $8 \times 5$ | $4 \times 8$ | $8 \times 6$ | $6 \times 4$ | $8 \times 9$ |
| 8. $7 \times 8$ | $6 \times 6$ | $5 \times 8$ | $8 \times 8$ | $9 \times 8$ |





## THE MYSTERIOUS 9's

1. Study the 9's table at the right. When you multiply 9 by 3, the answer is 27. You see that the first figure of 27 is 2 which is 1 less than the 3 by which you multiplied.

2. When you multiply 9 by 7, you get 63. The first figure of 63 is 6 which is 1 less than 7.

| | |
|---|---|
| $2 \times 9 = 18$ | $1 + 8 = 9$ |
| $3 \times 9 = 27$ | $2 + 7 = 9$ |
| $4 \times 9 = 36$ | $3 + 6 = 9$ |
| $5 \times 9 = 45$ | $4 + 5 = 9$ |
| $6 \times 9 = 54$ | $5 + 4 = 9$ |
| $7 \times 9 = 63$ | $6 + 3 = 9$ |
| $8 \times 9 = 72$ | $7 + 2 = 9$ |
| $9 \times 9 = 81$ | $8 + 1 = 9$ |

*In the 9's table the first figure of each answer is 1 less than the number by which 9 is multiplied.*

3. Look again at the answers in the 9's table. The first answer is 18; if you add 1 and 8, you get 9. The second answer is 27; if you add 2 and 7, you get 9. Add the figures in each of the other answers. Is the sum always 9?

*If you know the first figure of an answer in the 9's table, you can get the second figure by adding enough to the first figure to make 9.*

4. Suppose you forget the answer to $8 \times 9$. The first figure of the answer is 1 less than 8 which is 7. To get the second figure of the answer, add enough to 7 to make 9. Since 7 and 2 make 9, the second figure of the answer is 2. So $8 \times 9 = 72$. Try this plan on other 9's facts.

5. If you forget $9 \times 6$, think "1 less than 6 is 5. 5 and 4 are 9, so the answer is 54. $9 \times 6 = 54$."

This is a test on the division facts. You should be able to give all the quotients orally within the time stated by the teacher:

| | | | | | | |
|---|---|---|---|---|---|---|
| 1. | 2)8 | 8)0 | 4)8 | 4)24 | 7)14 | 2)16 |
| 2. | 1)2 | 6)6 | 1)0 | 7)49 | 3)15 | 6)42 |
| 3. | 3)0 | 1)9 | 6)48 | 5)20 | 9)27 | 4)20 |
| 4. | 2)4 | 4)4 | 7)63 | 3)18 | 6)36 | 9)54 |
| 5. | 1)5 | 2)0 | 5)25 | 8)64 | 2)10 | 5)15 |
| 6. | 3)9 | 1)8 | 9)36 | 4)28 | 7)21 | 6)30 |
| 7. | 9)9 | 4)0 | 2)18 | 7)42 | 8)40 | 4)16 |
| 8. | 5)0 | 5)5 | 8)16 | 5)30 | 9)81 | 3)12 |
| 9. | 1)7 | 9)0 | 9)63 | 3)27 | 8)56 | 5)10 |
| 10. | 6)0 | 3)3 | 2)12 | 8)72 | 6)24 | 8)32 |
| 11. | 1)3 | 2)6 | 5)35 | 7)28 | 9)72 | 3)24 |
| 12. | 7)7 | 8)8 | 4)32 | 6)18 | 4)12 | 7)56 |
| 13. | 3)6 | 7)0 | 8)48 | 5)40 | 9)18 | 2)14 |
| 14. | 2)2 | 1)6 | 7)35 | 3)21 | 8)24 | 6)54 |
| 15. | 1)4 | 1)1 | 5)45 | 6)12 | 9)45 | 4)36 |

To the Teacher: See the suggestions on page 308.



If you forget the answer to a division fact like 6)42, ask yourself this question: "How many 6's make 42?" If you remember your multiplication facts well, you know that seven 6's make 42. This tells you that 6)42 is 7.

If you did not do well on the division test on page 16, it is probably because you have not mastered the multiplication facts. If you have trouble with the division test, first take the multiplication test on page 6. Then try again the division test on page 16. See ex. 1 on page 12.

## UNEVEN DIVISION FACTS

A division fact like 3)12 is called an *even* division fact because 3 divides 12 *exactly* or *evenly*. A division fact like 3)14 is an *uneven* division fact because 3 does not divide 14 exactly; in this case the answer is 4 with 2 left over.

Divide mentally. Give only the quotient and the remainder:

For example, in 2)17, say only "8 and 1 over."

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1. | 2)17 | 3)26 | 5)42 | 4)30 | 5)27 | 4)39 | 6)44 |
| 2. | 4)17 | 7)39 | 8)61 | 3)14 | 5)44 | 2)15 | 3)28 |
| 3. | 6)25 | 9)46 | 3)22 | 7)50 | 5)32 | 2)19 | 8)41 |
| 4. | 8)50 | 5)38 | 4)35 | 9)75 | 6)35 | 3)29 | 5)24 |
| 5. | 7)19 | 9)17 | 6)47 | 8)77 | 9)30 | 7)60 | 3)20 |
| 6. | 6)51 | 5)48 | 8)30 | 4)31 | 6)52 | 9)70 | 7)40 |
| 7. | 4)21 | 7)62 | 9)25 | 6)39 | 8)29 | 2)13 | 3)25 |
| 8. | 7)11 | 3)17 | 8)55 | 4)27 | 6)17 | 7)25 | 9)50 |

1. In short division the work is sometimes done by writing down all the steps as shown below at *A*; this is called the *long form* of short division. The work may also be done in the short form, doing all the steps mentally and writing down only the answer, as shown at *B*. The short form is used when the divisors are 2, 3, 4, and 5. The long form is used when the divisors are 6, 7, 8, and 9; you may use the short form, however, with these divisors if you can get the answers quickly and accurately that way.

| *A. Long Form* | *Check* | *B. Short Form* |
|---|---|---|
| 908 Quotient | 908 | 908 R4 |
| Divisor 6)5452 Dividend | 6 | 6)5452 |
| 54 | 5448 | |
| 52 | 4 | |
| 48 | 5452 | |
| 4 Remainder | | |

2. In division the number that you divide is called the *dividend*, the number by which you divide is the *divisor*, and the answer is the *quotient*. If there is a number left over, it is called the *remainder*.

Divide and check:

| | | | | | |
|---|---|---|---|---|---|
| 3. | 6)8250 | 2)9276 | 7)2705 | 9)9245 | 5)14816 |
| 4. | 3)7941 | 4)1780 | 8)9909 | 6)8574 | 9)56277 |
| 5. | 8)5672 | 9)5256 | 2)7710 | 5)3270 | 4)20304 |
| 6. | 5)7538 | 7)6629 | 6)4109 | 3)4549 | 8)58872 |
| 7. | 7)7343 | 2)4599 | 8)3752 | 7)8505 | 4)25530 |
| 8. | 9)8168 | 3)9295 | 5)9365 | 4)6905 | 6)30444 |



1. Fred's Scout troop hiked 51 mi. in 4 da. Find the average number of miles the troop hiked per day.

2. Five boys were playing ball and broke a window. It cost $3.15 to put in a new glass. The boys shared the cost equally. What was each boy's share?

3. Alice paid $1.50 for 6 red roses. What was the cost of each rose?

4. Tom's father drove 171 mi. in 6 hr. How many miles per hour did he average?

5. Jack spent 65 da. at camp last summer. How many weeks and days was Jack at camp?

6. At 8¢ each, how many pears can Jane buy with 50¢?

Divide. Write the remainder as a fraction in the quotient. Check the work by multiplying:

| | | | | | |
|---|---|---|---|---|---|
| 7. | 3)1540 | 7)4509 | 5)9236 | 8)1159 | 4)2375 |
| 8. | 6)8045 | 9)2374 | 3)2072 | 7)2145 | 2)3417 |
| 9. | 4)1635 | 8)9659 | 6)2371 | 3)5184 | 7)1958 |
| 10. | 9)3356 | 5)7041 | 8)2273 | 6)9433 | 3)8264 |
| 11. | 5)3927 | 3)2356 | 9)1567 | 4)2695 | 6)1097 |
| 12. | 8)3015 | 6)3427 | 4)3127 | 9)2941 | 5)8362 |
| 13. | 7)3306 | 4)3591 | 9)3807 | 5)2367 | 8)4627 |
| 14. | 4)7237 | 7)4592 | 3)1974 | 6)4121 | 9)4729 |
| 15. | 8)5037 | 5)4052 | 7)5827 | 4)1057 | 6)5273 |
| 16. | 3)2519 | 8)6743 | 6)6937 | 9)5904 | 7)6725 |

# ROMAN NUMERALS

1. Roman numerals are often used today to number the chapters in books. They are also used to number the volumes in sets of books. Tell some other places where Roman numerals are used.

2. Only seven letters are used in the Roman system of writing numbers. The letters have these values:

| I | V | X | L | C | D | M |
|---|---|---|---|---|---|---|
| 1 | 5 | 10 | 50 | 100 | 500 | 1000 |

3. The following rules tell how to read Roman numerals:

Rule A. If the letters are alike, or if the first letter has a greater value than the second, add them.

XX = 10 + 10, or 20
VII = 5 + 1 + 1, or 7
CCC = 100 + 100 + 100, or 300
DCC = 500 + 100 + 100, or 700

Rule B. If the first letter has a smaller value than the second, subtract the first from the second.

IV = 5 − 1, or 4
IX = 10 − 1, or 9
XC = 100 − 10, or 90
CD = 500 − 100, or 400

IV may also be written as IIII. 900 may be written as CM or as DCCCC.

Read these numbers:

| | | | | | |
|---|---|---|---|---|---|
| 4. | XXIV | XVIII | LVI | MCD | DCCCCL |
| 5. | XLII | XLIX | LXIX | CDL | CDLVI |
| 6. | CIV | CMX | CMLV | MCM | LXXIV |
| 7. | CCX | MDC | XCIX | MCCC | MCMXIX |

Write these numbers, using Roman numerals:

| | | | | | | |
|---|---|---|---|---|---|---|
| 8. | 38 | 97 | 427 | 1100 | 1400 | 1500 |
| 9. | 19 | 87 | 349 | 1860 | 1900 | 1947 |
| 10. | 73 | 55 | 964 | 1776 | 1812 | 1860 |

11. The cornerstone of an old church reads: "Built MDCCLV." When was the church built?

# ROUND NUMBERS



1. Joe asked his father how many people live in the United States. His father said that the census of 1940 gave the population as *about* 130,000,000 people. He told Joe that this figure was only a *round number* and that Joe could find the exact number by looking in the *World Almanac*. Joe did this and found the number 131,669,275 for the population of the United States in the 1940 census.

A number like 131,669,275 is difficult to remember; the population also changes each day due to births and deaths. So it is more practical to say that the population in 1940 was *about* 130,000,000. When you say that 131,669,275 is *about* 130,000,000, you are rounding off 131,669,275 correct to the nearest 10 million.

2. The next 10 million above 130 million is 140 million. You see that 131,669,275 is much closer to 130 million than it is to 140 million; for this reason you say that the population was *about* 130 million. If the population had been 138,962,504, you could call it *about* 140 million since 138,962,504 is closer to 140 million than to 130 million.

3. The number 4826 is nearer to 5000 than it is to 4000. When you *round off* 4826 to the nearest thousand the result is 5000. Round off 4173 to the nearest thousand. The number 724 is nearer to 700 than to 800. So 724, when rounded off to the nearest hundred, becomes 700.

4. Round off these numbers to the nearest thousand:

7280 9685 6850 9892 8039 3391

5. Round off these numbers to the nearest hundred:

486 215 375 928 133 842

6. Round off these numbers to the nearest million:

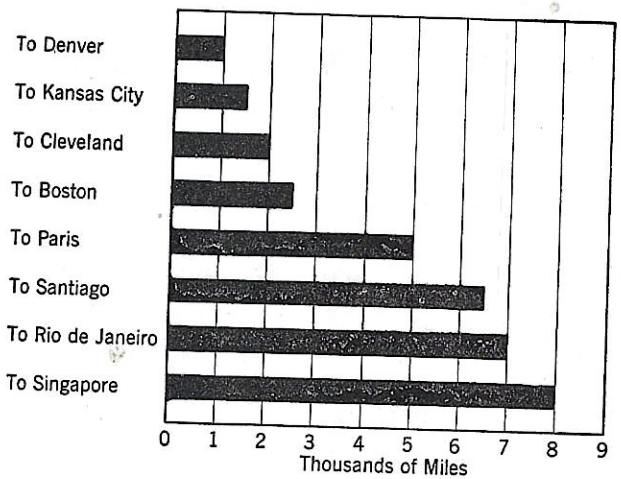
5,782,416 3,076,210 6,923,000 8,251,171

7. Round off these numbers to the nearest ten:

29 41 63 88 54 99 72 11

1. Study the bar graph below. The numbers at the bottom of the graph show distances in miles and are called the *scale*. These numbers stand for *thousands*. Thus, 2 stands for 2000. What distance is represented by the length from 0 to 2? from 0 to 8? from 0 to 6? from 0 to 5?

APPROXIMATE DISTANCES FROM SEATTLE




2. The first bar on the graph shows the approximate distance from Seattle to Denver. About how many miles is it?

3. The second bar shows the distance from Seattle to Kansas City. This bar ends halfway between 1 and 2 so it shows a distance halfway between 1000 mi. and 2000 mi. What number is halfway between 1000 and 2000? How many miles is it from Seattle to Kansas City?

4. What is the distance from Seattle to Cleveland? to Boston? to Paris? to Santiago? to the other two cities?

5. The approximate air distances from Chicago to these places are as follows: To London, 4000 mi.; to Buenos Aires, 5500 mi.; to Bagdad, 6500 mi.; to Guam, 7500 mi.; to Bombay, 8000 mi.; to Cape Town, 8500 mi.; to Singapore, 9500 mi. Draw a bar graph showing these distances.



1. Mr. Allen has a chicken farm. In the month of August he got a total of 8031 eggs. How many eggs on the average did he get per day?

(1) The first partial dividend is 80. To estimate the first quotient figure *divide* 8 by 3. This gives 2 as the first quotient figure. Write 2 over the 0 of 80. *Multiply* 31 by 2, which gives 62. *Subtract* 62 from 80, which gives a remainder of 18. Since the remainder 18 is *less than the divisor* 31 the quotient 2 is right.

```
      259        Check
31)8031           259
   62             31
   183            259
   155            777
    281           8029
    279              2
      2           8031
```

*When you have the right quotient figure, the remainder will always be less than the divisor.*

(2) *Bring down* 3, which gives 183 as the next partial dividend. *Divide* 18 by 3, which gives 6 as the second quotient figure. When you multiply 31 by 6, you get 186, which is too large to be subtracted from 183. Try 5 as the quotient figure. When you subtract 155 from 183, is the remainder less than the divisor?

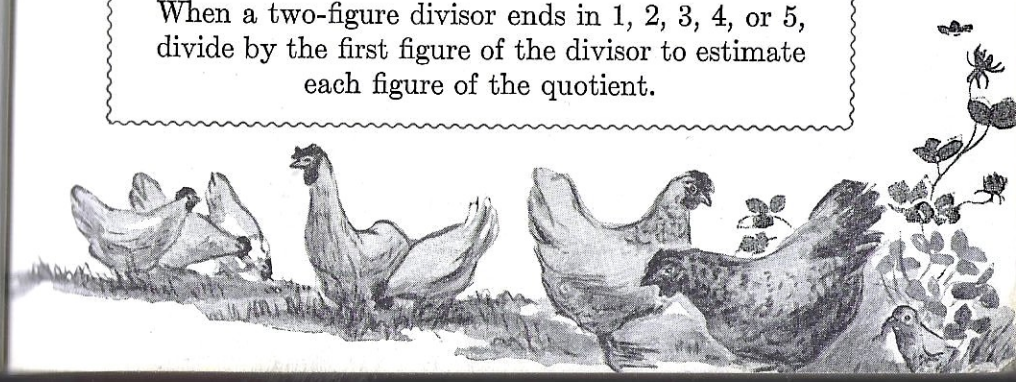
*When the quotient figure is too large, try the next smaller figure.*

(3) *Bring down* 1, which gives 281 as the next partial dividend. *Divide* 28 by 3, which gives 9 as the quotient. Why is 9 right?

The quotient is 259, with a remainder of 2. Mr. Allen got about 259 eggs per day on the average.

To check the work multiply 259 by 31 and add the remainder 2. The result should equal the dividend 8031.

When a two-figure divisor ends in 1, 2, 3, 4, or 5, divide by the first figure of the divisor to estimate each figure of the quotient.



1. A pilot flew 2441 mi. from Fairbanks to Minneapolis in 12 hr. How many miles per hour did he average?

2. An airplane flies a distance of 3675 mi. in 21 hr. How many miles per hour does it average?

3. Mr. Brown drove his car 9620 mi. last year. How many miles on the average was that per week?

4. There are 748 pupils in our school. That is an average of how many pupils for each of the 22 classrooms?

5. A total of 1634 passengers left from the bus station on Saturday in 43 busses. What was the average number of passengers per bus?

Divide and check. Use the rule on page 23 to find the quotient figures. Write R before each remainder:

| | | | | | |
|---|---|---|---|---|---|
| 6. | 32)1376 | 21)2654 | 64)2005 | 35)25584 | 93)43444 |
| 7. | 43)3228 | 54)9882 | 72)2088 | 93)35991 | 62)48681 |
| 8. | 55)1989 | 42)9211 | 53)3885 | 22)13955 | 31)19997 |
| 9. | 23)1939 | 33)8029 | 85)4971 | 54)11509 | 72)23623 |
| 10. | 35)2205 | 24)7785 | 45)2880 | 64)39616 | 54)19823 |
| 11. | 53)4977 | 41)9647 | 71)4842 | 92)44995 | 34)17891 |
| 12. | 22)1303 | 74)9199 | 32)1765 | 80)28657 | 95)24437 |
| 13. | 74)2738 | 52)6188 | 83)1984 | 45)20846 | 82)64045 |
| 14. | 81)5272 | 43)9227 | 25)1831 | 81)30388 | 44)23499 |
| 15. | 65)5532 | 31)8232 | 44)2781 | 63)13750 | 85)31195 |



1. Last month Mr. West took in $1277.25 from the sale of 39-cent books. How many books did he sell at this price?

Write $1277.25 as 127725¢ and divide by 39¢.

> When a two-figure divisor ends in 6, 7, 8, or 9, divide by 1 more than the first figure of the divisor to estimate each quotient figure.

(1) Since the first figure of 39 is 3, use 4 as the trial divisor. You may do this since 39 is almost 40. To find the first quotient figure, think "12 ÷ 4 = 3." Using 3 as the quotient you get the remainder 10, which is less than the divisor. So 3 is the right quotient figure.

(2) Tell how you obtain 2 and 7 as the next quotient figures.

```
      3275
39)127725
   117
    107
     78
      292
      273
       195
       195
```

(3) For the last quotient figure think "There are four 4's in 19." Using 4 as the quotient, you get a remainder of 39, which is *equal* to the divisor. This shows that the quotient figure should be 5 instead of 4, since the remainder 39 will contain 39 one more time. The quotient is 3275. Mr. West sold 3275 books.

*When the remainder is equal to or larger than the divisor, try the next larger figure as quotient.*

Divide and check:

| | | |
|---|---|---|
| 2. 24,889 ÷ 46 | 169,296 ÷ 48 | 132,300 ÷ 28 |
| 3. 89,275 ÷ 28 | 381,017 ÷ 79 | 571,444 ÷ 76 |
| 4. 32,676 ÷ 37 | 625,350 ÷ 66 | 324,336 ÷ 87 |
| 5. 19,973 ÷ 26 | 253,518 ÷ 87 | 279,794 ÷ 37 |
| 6. 67,392 ÷ 39 | 124,166 ÷ 49 | 439,756 ÷ 58 |
| 7. 47,927 ÷ 78 | 383,496 ÷ 57 | 171,028 ÷ 46 |
| 8. 76,599 ÷ 27 | 751,071 ÷ 89 | 272,004 ÷ 76 |

1. The circus gave 28 performances in Johnson City with a total attendance of about 100,000 people. About how many people on the average attended each performance?

2. Mr. Bell bought 36 bicycles to sell. They cost him $606.60 in all. What was the average cost per bicycle?

3. There are 18,278 pupils in the elementary grades of Bayville. They attend 38 elementary schools. What is the average number of pupils per school?

Divide. Check the work by multiplying:

| | | | | |
|---|---|---|---|---|
| 4. | 39)28164 | 48)29943 | 59)186623 | 88)776500 |
| 5. | 26)96758 | 29)74332 | 56)532616 | 47)356307 |
| 6. | 67)10403 | 79)35234 | 36)132076 | 49)374527 |
| 7. | 19)79534 | 86)42484 | 58)273846 | 77)254960 |
| 8. | 47)38117 | 38)27181 | 27)210492 | 69)472926 |
| 9. | 28)47208 | 56)14224 | 67)263185 | 38)369821 |
| 10. | 36)13848 | 57)44223 | 68)228643 | 29)154251 |

1. Study the examples below. Then copy them without the work and do them yourself. Check your work:

```
     920          409          5008
37)34040     54)22093     46)230386
   333          216          230
    74           493          386
    74           486          368
     0             7           18
```

```
Check        Check        Check
  920          409          5008
   37           54            46
 6440         1636         30048
2760         2045         20032
34040       22086        230368
                7            18
            22093        230386
```

2. In a recent year, 32,245 people in the United States were killed in automobile accidents. On the average about how many people were killed per week?

3. Our class has 15 music books that cost $16.35. What was the cost of each book?

Divide and check. Write R before the remainder:

| | | | | |
|---|---|---|---|---|
| 4. | 22)1980 | 54)26473 | 29)118040 | 16)48096 |
| 5. | 46)3229 | 37)34046 | 81)324409 | 52)156089 |
| 6. | 88)4417 | 55)33229 | 42)213365 | 19)76152 |
| 7. | 25)8750 | 93)19162 | 78)650545 | 32)64267 |
| 8. | 62)6535 | 24)18000 | 35)105299 | 17)51685 |
| 9. | 38)7955 | 72)27365 | 64)195203 | 90)366337 |

Here are three sets of division examples. If you get all the examples right in the first set, you need not do the other two sets. If you need more practice, do Sets II and III.

### Set I

Divide and check. Write R before each remainder:

| | | | |
|---|---|---|---|
| 1. 25)1128 | 18)15235 | 51)143275 | 33)116846 |
| 2. 36)1001 | 63)46309 | 84)532567 | 72)374411 |
| 3. 53)2875 | 46)34500 | 27)217728 | 68)252227 |
| 4. 48)2976 | 91)43608 | 43)258179 | 53)375794 |
| 5. 72)8923 | 87)26470 | 75)465331 | 49)196309 |

### Set II

| | | | |
|---|---|---|---|
| 6. 57)1955 | 21)11219 | 62)340573 | 79)204064 |
| 7. 32)1187 | 17)13775 | 43)228771 | 52)378569 |
| 8. 45)3022 | 94)33657 | 34)104735 | 86)516269 |
| 9. 74)4801 | 87)48751 | 59)356247 | 65)247014 |

### Set III

| | | | |
|---|---|---|---|
| 10. 21)6869 | 66)34993 | 33)160551 | 51)181571 |
| 11. 75)4279 | 82)26079 | 88)618651 | 67)134098 |
| 12. 57)1547 | 19)16214 | 54)333180 | 35)199508 |
| 13. 34)2395 | 23)11995 | 76)457841 | 17)157323 |



1. Mary saw two cans of corn in a store. One can was marked "12 oz." and the other was marked "1 lb. 4 oz." Which can held more ounces of corn and how many ounces more?

2. Today the milkman delivered to the school lunchroom 70 qt. of milk in $\frac{1}{2}$-pint bottles. How many bottles of milk did he deliver?

3. With a yardstick Tom measured to find how much wire netting he needed for a chicken yard. He found that 32 yd. would be enough. The netting is sold in rolls, each containing 100 ft. of netting. How many rolls did Tom order?

4. Last week Joe sold 4 doz. eggs and gave 8 eggs to his mother. How many eggs did he get in all last week?

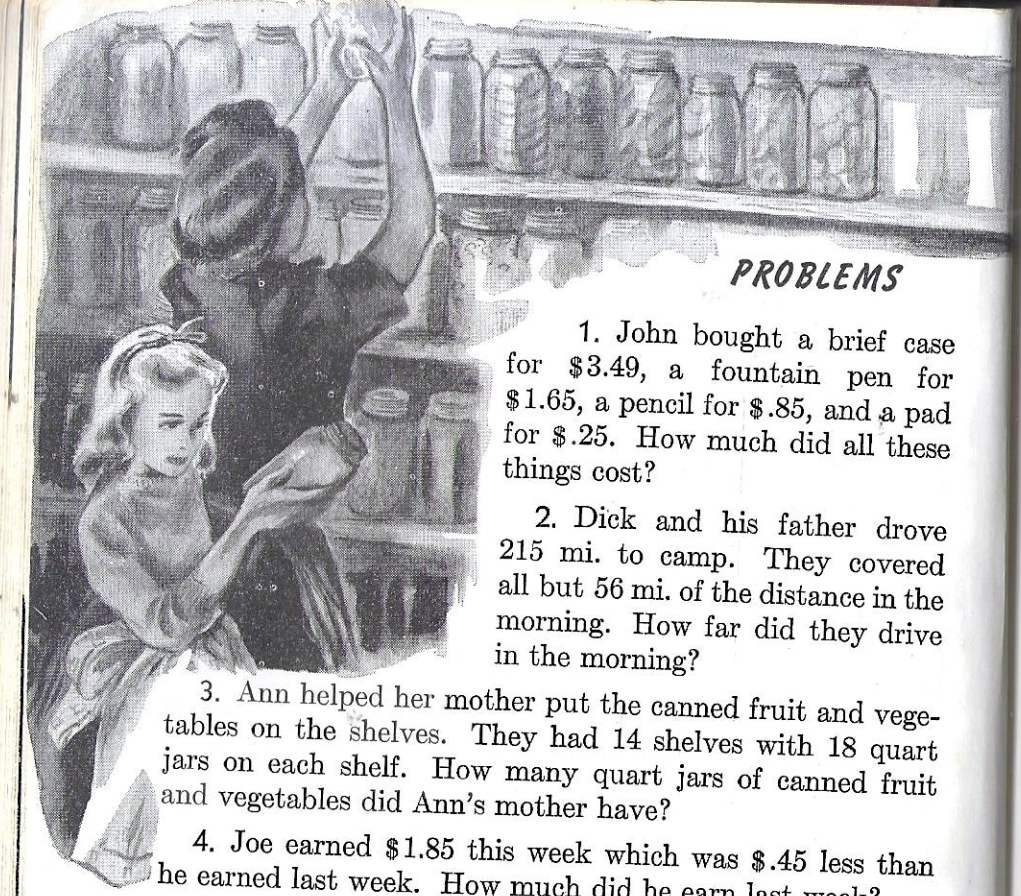
5. If eggs sell at 48¢ a dozen, how much will you have to pay for $\frac{1}{2}$ doz. eggs? for $\frac{1}{4}$ doz. eggs?

6. Jack was in camp all of July and all of August. He said he was in camp 9 wk. Was he right? If not, how many days wrong was he?

Tell the number that should be put in each space:

| | | | |
|---|---|---|---|
| 7. 1 ft. = .. in. | 1 lb. = .. oz. | 30 min. = .. hr. |
| 8. 9 ft. = .. yd. | 8 qt. = .. gal. | 20 qt. = .. gal. |
| 9. 2 bu. = .. pk. | 1 hr. = .. min. | 10 gal. = .. qt. |
| 10. $\frac{1}{2}$ hr. = .. min. | 3 lb. = .. oz. | 21 da. = .. wk. |
| 11. 1 mi. = .. ft. | 8 oz. = .. lb. | $\frac{1}{4}$ ton = .. lb. |
| 12. 2 yr. = .. mo. | 6 hr. = .. min. | 1 yr. = .. wk. |
| 13. $\frac{1}{4}$ lb. = .. oz. | 9 yd. = .. ft. | 14 pt. = .. qt. |
| 14. $\frac{3}{4}$ hr. = .. min. | $\frac{1}{2}$ bu. = .. qt. | $\frac{1}{2}$ min. = .. sec. |
| 15. $\frac{1}{4}$ bu. = .. pk. | $\frac{1}{2}$ yr. = .. mo. | 1 ton = .. lb. |
| 16. 6 mo. = .. yr. | $\frac{1}{2}$ yd. = .. in. | $\frac{1}{4}$ gal. = .. qt. |

To the Teacher: Caution pupils never to write in their books to fill in blank spaces.



## PROBLEMS

1. John bought a brief case for $3.49, a fountain pen for $1.65, a pencil for $.85, and a pad for $.25. How much did all these things cost?

2. Dick and his father drove 215 mi. to camp. They covered all but 56 mi. of the distance in the morning. How far did they drive in the morning?

3. Ann helped her mother put the canned fruit and vegetables on the shelves. They had 14 shelves with 18 quart jars on each shelf. How many quart jars of canned fruit and vegetables did Ann's mother have?

4. Joe earned $1.85 this week which was $.45 less than he earned last week. How much did he earn last week?

5. This summer Jack made $16.35 selling vegetables from his garden. This was $3.95 more than he made last year. How much money did Jack make last year?

6. Jane visited her uncle who lives on a farm. The first week Jane was there her uncle sold 1035 baskets of peaches at an average price of $1.75 a basket. How much money did he get from the sale of peaches that week?

7. The next week he sold 897 baskets of peaches. How many more baskets of peaches did he sell the first week than the second week? See ex. 6.

8. Jane's uncle also sold 8 crates of eggs while she was there. Each crate holds 30 doz. eggs. How many eggs are there in 8 crates of eggs?





The problems on this page are not complete because no question has been asked. Make a good question for each problem using all the facts that are given. Then find the answer to your question:

1. George earned money last summer picking strawberries. He received 4¢ for every quart he picked. All together he picked 350 qt.

2. When John went to camp it took him from 10:45 A.M. to 2:05 P.M. to reach the camp by bus.

3. Mrs. White's bill at the store was $2.38. She gave the clerk $3.00 to pay the bill.

4. Mary's mother gave her 75¢ to buy some air mail stamps. The stamps cost 8¢ each.

5. Mr. Blake used 15 gal. of gasoline on a 270-mile automobile trip to Blue Mountain Lake.

6. In the summer Bill earned $9.80 cutting the lawn for a neighbor and $12.30 pulling weeds in the garden.

7. Our class of 18 spent $4.50 for food for a picnic.

8. Alice Jane is 9 yr. older than her sister Margaret. Margaret is 12 yr. old.

9. There are 465 pupils in our school this year. This is 47 pupils more than we had last year.

10. Grace wants to buy a small camera that costs $10.89. She has saved $7.92.

11. Mr. White can average 32 mi. an hour in his car. Tomorrow he is going to make a trip of 256 mi.

12. At a sale Sally bought a sweater for $2.95. The regular price of the sweater was $3.75.

13. It took a train 8 hr. to travel 360 mi.

14. It costs Jane 14¢ a day to ride to school and back on the bus. She rides to school and back once each day. She did not miss any of the 22 days of school last month.

## ORAL PRACTICE

1. Read these numbers: 824,560 3,150,290 43,615,400 725,600,000 1,510,625,000 26,295,326,409

2. Round off each number to the nearest hundred:
439 690 579 719 265 881

3. Round off each number to the nearest thousand:
1159 3292 8640 7059 4317 9750

4. Read these Roman numbers: CD CCLX DCLXX CM MCDL MCMXLV MDCCCL

5. Count by 8's from 5 to 69; by 7's from 9 to 79.

Give the answers only. Do the work in your head:

6. $27 + 9$ $45 + 6$ $33 + 8$ $72 + 7$ $66 + 4$
7. $38 + 4$ $82 + 9$ $94 + 7$ $25 + 8$ $43 + 6$

Give the answers orally:

8. $6\overline{)35}$ $9\overline{)56}$ $3\overline{)29}$ $5\overline{)43}$ $7\overline{)60}$ $8\overline{)51}$ $2\overline{)17}$

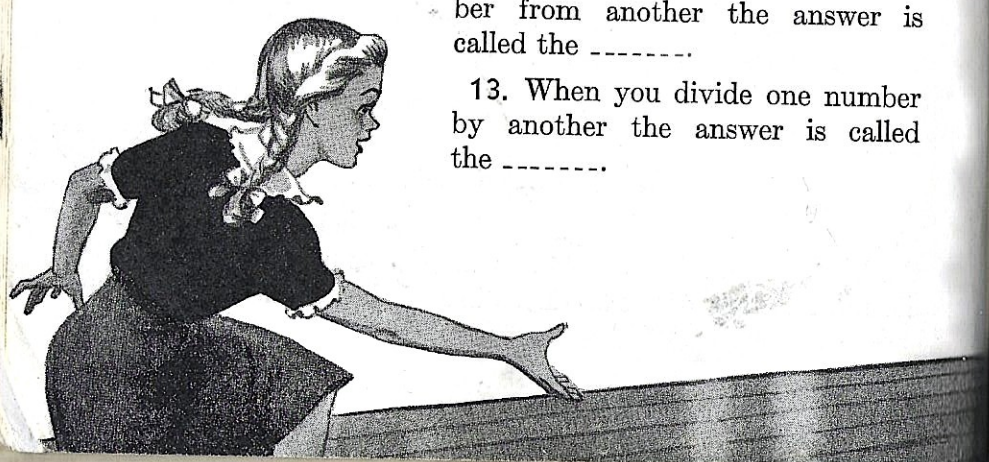
9. $8\overline{)60}$ $4\overline{)23}$ $7\overline{)38}$ $6\overline{)23}$ $3\overline{)23}$ $5\overline{)27}$ $9\overline{)75}$

Give the answers only. Do the work in your head:

10. $4 \times 9 + 3$ $7 \times 8 + 6$ $8 \times 6 + 7$ $9 \times 3 + 7$
11. $7 \times 5 + 4$ $9 \times 5 + 8$ $5 \times 9 + 3$ $8 \times 8 + 7$

12. When you subtract one number from another the answer is called the _____.

13. When you divide one number by another the answer is called the _____.





## A TEST IN PROBLEM SOLVING

1. Jim bought a football for $3.49. How much change did he get from $5.00?

2. One Saturday in September four boys sold vegetables from their school gardens. When the vegetables were sold the boys had 3 one-dollar bills, 3 half dollars, 9 quarters, 8 dimes, 3 nickels, and 14 pennies. If the boys shared the money equally, what was each boy's share?

3. Mrs. Wilson paid $1.15 for a 5-pound pail of honey. What was the price of the honey per pound?

4. A train travels at an average speed of 54 mi. an hour. How many hours does the train take to cover a distance of 864 mi.?

5. Mrs. White bought oranges for $.29, potatoes for $.25, lettuce for $.14, squash for $.22, melons for $.35, and celery for $.19. How much did Mrs. White spend in all?

6. Last winter Mr. King sold 885 boxes of oranges at $4.75 a box. How much did he get for the oranges?

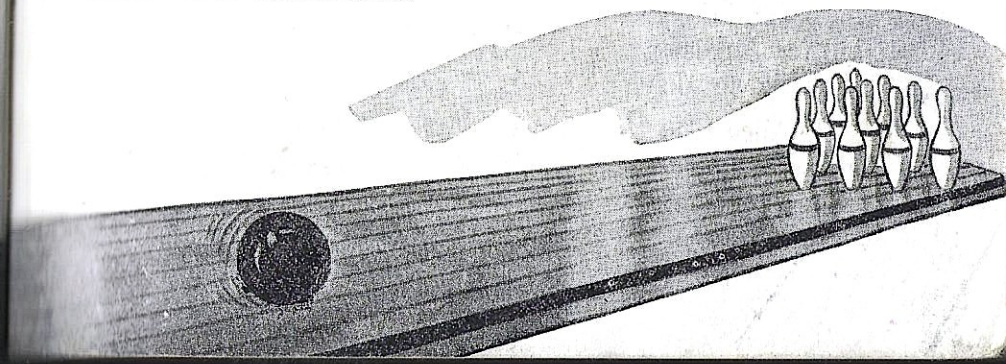
7. Alice earned $32.50 last summer. If she spends $25.75 for a bicycle, how much money will she have left?

8. Find the cost of 15 yd. of canvas at $1.29 a yard.

9. How many yards are there in 1728 inches?

10. Mr. West paid $35.85 each for 4 airplane tickets to Washington. Find the total cost of the tickets.

This tells what your score means:
Poor: 0 to 5 right. Fair: 6 or 7.
Good: 8 or 9. Excellent: 10.



1. Write these numbers in Roman numerals: 86, 43, 97, 107, 459, 1500, 965, 1776, 1925, 1948.

2. Arrange in order of their size, putting the smallest number first: LXIV, XLIX, MC, XCIII, CMX, DCCV.

3. Round off each number to the nearest hundred:

| | | | | | |
|---|---|---|---|---|---|
| 129 | 672 | 394 | 590 | 837 | 889 |

4. Round off each number to the nearest thousand:

| | | | | |
|---|---|---|---|---|
| 2099 | 8615 | 4328 | 1979 | 6705 |

5. Round off each number to the nearest ten thousand:

| | | | | |
|---|---|---|---|---|
| 12,475 | 37,998 | 53,386 | 29,451 | 71,815 |

6. Write these numbers in figures: Seven hundred thousand; thirty-five thousand six hundred twenty-five; one billion five million six hundred thousand; twenty-five million eight hundred sixty thousand.

7. Find the difference between 24,638 and 72,400.

8. Find the quotient if you divide 16,821 by 63.

9. Find the product of 4638 and 75.

10. How much more is $500.00 than $389.14?

11. Find the sum of 1648, 4856, 789, and 3526.

12. How many minutes is it from 10:45 A.M. to 2:06 P.M.?

13. Jack left home for camp at 9:35 A.M. He arrived at camp at 1:47 P.M. How long did it take him to go to camp?

14. Mrs. Green gets 2 qt. of milk a day. The milk costs 16¢ a quart. In August she had the milk deliveries stopped for several days while she was away on vacation. Her milk bill for August was $8.00. How many days in August was the milk not delivered?

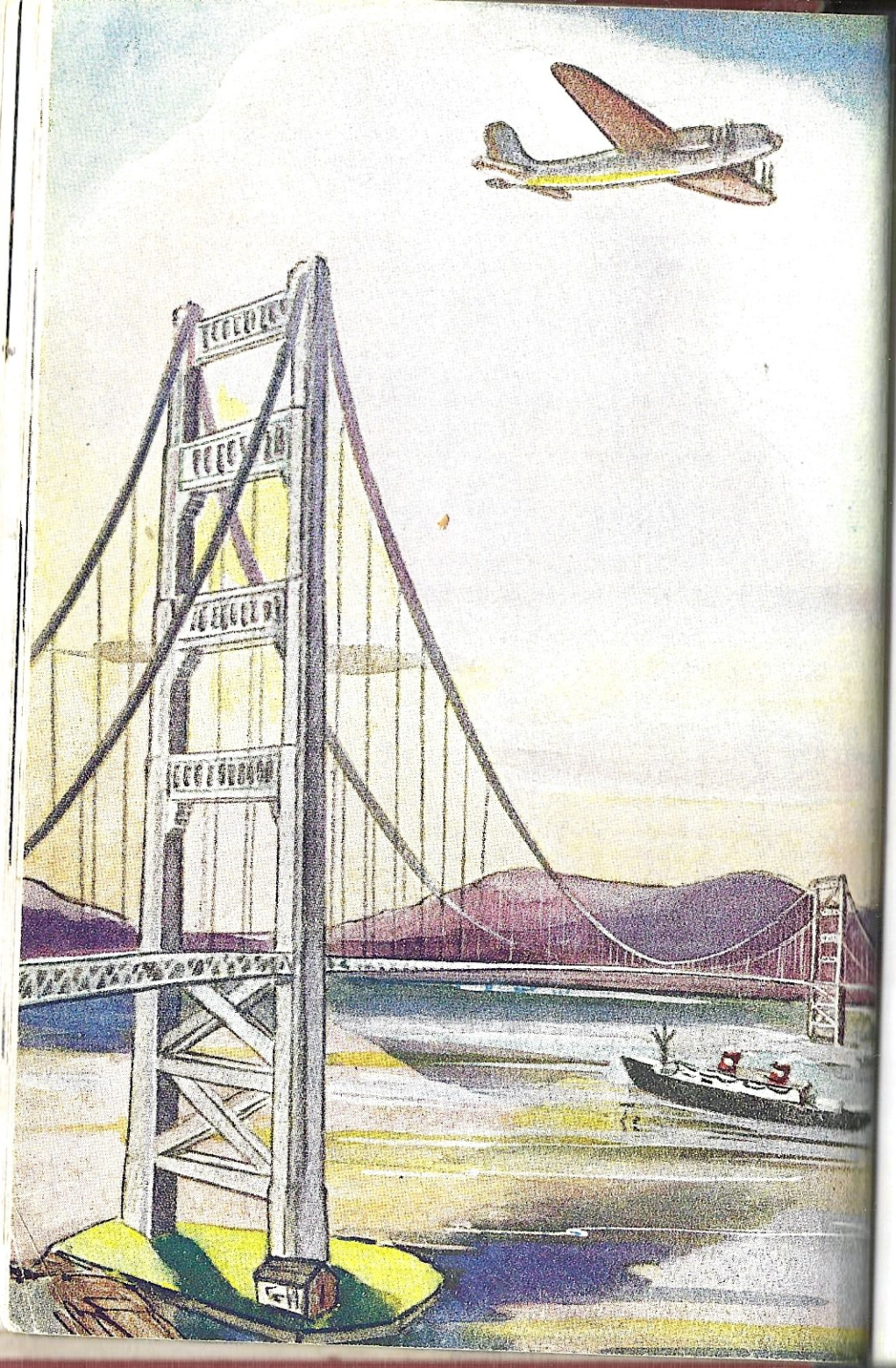
15. Alice read that Ribbon Falls in California is 1612 ft. high. She said that is about $\frac{1}{2}$ mi. high. Is Alice's answer correct? If not, how much too large or too small is it?



If you miss more than one example in any row, turn to the Practice Pages for that row:

| | | | | | | PRACTICE PAGES |
|---|---|---|---|---|---|---|
| Add and check: | | | | | | |
| 1. | 682<br>898<br>756<br>505 | 786<br>869<br>345<br>314 | 342<br>597<br>744<br>284 | 984<br>247<br>353<br>648 | 725<br>499<br>652<br>814 | 8 |
| 2. | 558<br>476<br>665<br>731<br>107 | 391<br>785<br>536<br>114<br>717 | 654<br>419<br>582<br>162<br>426 | 389<br>123<br>696<br>758<br>535 | 552<br>578<br>943<br>277<br>439 | 8 |
| Subtract and check: | | | | | | |
| 3. | 4175<br>3359 | 1020<br>426 | 55356<br>34663 | 80414<br>52478 | | 10 |
| 4. | 6269<br>4792 | 8371<br>3567 | 40000<br>21371 | 85679<br>47386 | | 10 |
| Multiply and check: | | | | | | |
| 5. | 738<br>257 | 387<br>194 | 417<br>368 | 594<br>275 | 629<br>704 | 12 |
| 6. | 2594<br>39 | 4195<br>46 | 3956<br>81 | 2608<br>62 | 4672<br>75 | 12 |
| Divide and check: | | | | | | |
| 7. | 63)2835 | 21)1409 | 44)18904 | | | 24 |
| 8. | 28)6079 | 56)208547 | 78)180809 | | | 25, 26 |
| 9. | 43)8992 | 69)276428 | 35)212809 | | | 27 |

Diagnostic test.



CHAPTER TWO

# Adding and Subtracting Fractions

## THE GOLDEN GATE BRIDGE

1. San Francisco has a very large bay which is one of the world's greatest harbors. The channel which connects the bay with the Pacific Ocean is called the Golden Gate. In 1937 a beautiful suspension bridge crossing the Golden Gate was completed. How many years ago was that?

2. A suspension bridge is one which has its roadway suspended from huge cables that pass over high towers at each end of the bridge. The distance between the towers is called the central span of the bridge. In the picture on the opposite page, point to the towers, the cables, and the roadway. Also point to the central span of the bridge.

3. The Golden Gate Bridge has the longest central span of any bridge in the world. This span is 4200 ft. long. How much more or less than $\frac{4}{5}$ of a mile is the length of this span? 1 mi. = 5280 ft.

4. The Golden Gate Bridge is made up of three parts. The longest part is the central span which is 4200 ft. long. There are also two end spans, each 1125 ft. long. Each end span is the part between the shore and the tower. Counting these three parts, how many feet long is the entire bridge? Is the length of the bridge a little more or a little less than $1\frac{1}{4}$ mi.?

5. The two great steel towers are each 746 ft. high. If a building were 746 ft. high, how many stories would it have if 12 ft. were allowed for each story?

1. The Golden Gate Bridge has the highest span of any suspension bridge in the world. The roadway or floor of the bridge is 220 ft. above the water at high tide and 236 ft. above at low tide. The great steamship *Queen Mary* measures 204 ft. from her water line to the top of her tallest mast. This ship could safely sail under the Golden Gate Bridge and have how many feet to spare at high tide? how many feet to spare at low tide?

2. Each of the cables that support the floor of the bridge was made up of 27,572 wires which were squeezed together as tightly as possible and then covered. When each cable was finished, it had a diameter of 3 ft. Draw a circle on the board with a diameter of 3 ft. to show how big around each cable is.

3. To make these cables it took enough miles of wire to stretch $1\frac{3}{5}$ times around the world at the Equator. The distance around the world at the Equator is 25,000 mi. How many miles of wire all together did it take to make the cables for the Golden Gate Bridge?

4. During a recent year 5,369,760 motor vehicles passed over the Golden Gate Bridge. This was an average of how many vehicles per month? of how many vehicles per day? Let 1 mo. = 30 da.

5. If the average toll charge was 50¢ for each vehicle that crossed the bridge, how much money in all was collected per day? See ex. 4.

6. The first great suspension bridge to be built was the famous Brooklyn Bridge, completed in 1883, which connects Brooklyn with New York. This bridge is still in use. For how many years has the Brooklyn Bridge been used? The span of the Brooklyn Bridge is 1595 ft. while that of the Golden Gate Bridge is 4200 ft. Is the span of the Golden Gate Bridge about $2\frac{1}{2}$ times or about $2\frac{2}{3}$ times as long as that of the Brooklyn Bridge?



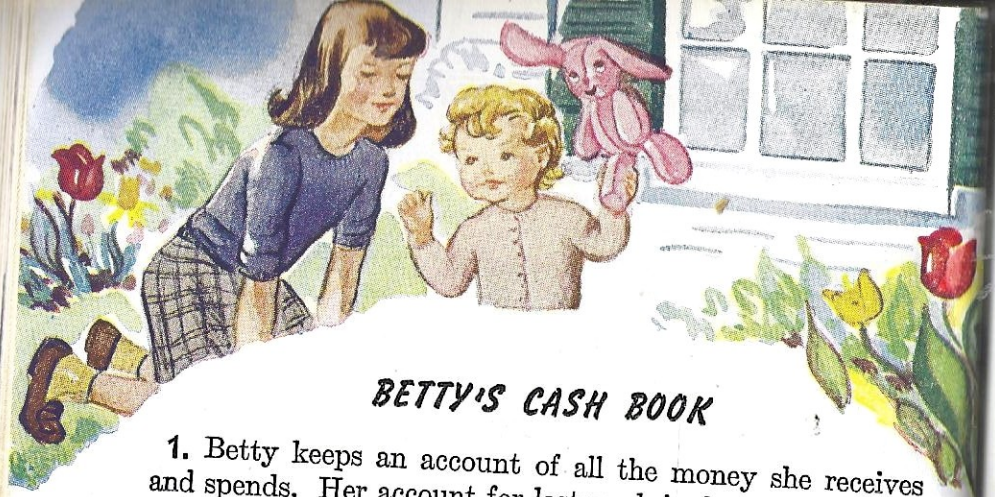
1. Jack is treasurer of a club whose members make airplane models. Each of the 24 members of the club pays dues of 5¢ a week. Jack collects the dues and keeps an *account* of the money he receives. He also pays out money for the club and enters it in the account. Here is Jack's account for the month of September:

| Money Received | | | | Money Paid Out | | | |
|---|---|---|---|---|---|---|---|
| Sept. 9 | Dues | 1 | 20 | Sept. 14 | 1 model knife | | 50 |
| Sept. 16 | Dues | 1 | 20 | | 5 knife blades | | 50 |
| Sept. 23 | Dues | 1 | 20 | Sept. 17 | 1 tube cement | | 08 |
| | | | | Sept. 26 | Wood | | 65 |
| | | | | Sept. 29 | Cash on hand | 1 | 87 |
| | Total | 3 | 60 | | | 3 | 60 |
| Sept. 29 | Cash on hand | 1 | 87 | | | | |

2. In September Jack received a total of $3.60 and spent a total of $1.73. Study the account and tell how each of these amounts was obtained.

3. When Jack subtracts $1.73 from $3.60 he finds that he should have $1.87 left in cash. $1.87 is called the *cash on hand.* Jack counts his cash and finds that he really has $1.87 left, so he writes "Cash on hand, $1.87" on the right side of the account and adds that side. The sum is $3.60; the account *balances* because both sides give a total of $3.60. Jack draws double lines under $3.60 on both sides to show that the account above these lines is correct. He then starts a new account, writing "Cash on hand, $1.87" on the left side under $3.60.

4. If Jack does not have the right amount of cash on hand to make his account balance, he may have forgotten to write down some amounts that he spent. If Jack had forgotten to write down the $.08 he spent for cement, what would happen when he tried to balance his account? What would happen if he forgot to enter some dues he had received?



## BETTY'S CASH BOOK

**1.** Betty keeps an account of all the money she receives and spends. Her account for last week is shown below:

| Money Received | | | | Money Paid Out | | | |
|---|---|---|---|---|---|---|---|
| Oct. 2 | Cash on hand | | 85 | Oct. 3 | Club dues | | 10 |
| Oct. 4 | Care of baby | | 50 | Oct. 4 | Book | | 49 |
| Oct. 7 | Allowance | | 50 | Oct. 6 | Pencil and eraser | | 15 |
| Oct. 8 | Helping Mrs. Lee | | 35 | Oct. 7 | Movies | | 35 |
| | | | | Oct. 9 | Cash on hand | | |

**2.** Balance Betty's account and tell how much cash she ought to have on hand on Oct. 9.

**3.** When Betty counted her cash on Oct. 9 she had only $.96 on hand. How much cash was she short? Then she remembered that she spent $.15 for a soda on Oct. 7 and forgot to write it down. Will her account balance now?

**4.** The next week Betty's account showed these items on the "Received" side: Oct. 9, $.96 cash on hand; Oct. 10, $.25 for running errands; Oct. 12, $.85 for care of baby; Oct. 14, $.50 for allowance; Oct. 15, $.35 for running errands. These items were on the "Paid Out" side: Oct. 10, $.14 for bus fare; Oct. 10, $.25 for lunch; Oct. 12, $.75 for birthday gift; Oct. 13, $.25 to Red Cross; Oct. 14, $.12 for stamps. Write Betty's cash account for that week and balance it.





1. A book in which you keep an account of the money you receive and spend is called a *cash book*. Make a cash book for your own use by drawing lines on a sheet of paper like those in Betty's account on page 40.

2. At the end of the week see if your account balances. To do this, count your cash on hand and enter it on the right side of your cash book. Then add the numbers on both sides of the book. If the sums are alike, your account balances, which means that it is correct. If the sums are not alike, the account is incorrect. In this case, try to think of any money you received or spent that you forgot to enter in your cash book. If you remember such items, write them in the book and then see if the account balances. Always enter promptly any money you receive or spend before you forget it.

3. On a sheet of paper draw lines for an account and enter these items as "Received:" Oct. 15, $.78 cash on hand; Oct. 17, $.60 for raking leaves; Oct. 19, $.55 for delivering newspapers; Oct. 20, $.75 for allowance; Oct. 21, $.25 from Uncle Jack. Also enter these items as "Paid Out:" Oct. 16, $.25 for football game; Oct. 16, $.10 for candy; Oct. 18, $.69 for Scout knife; Oct. 19, $.50 for present for Bob; Oct. 20, $1.00 put in bank; Oct. 21, $.35 for bus fare and lunch. Then balance the account. How much cash ought you to have on hand on Oct. 22?

4. Here is Fred's account for a week. Money received: Oct. 2, cash on hand, $.46; Oct. 5, for picking apples, $.75; Oct. 6, for cleaning car, $.50. Money paid out: Oct. 4, notebook, $.09; Oct. 4, movie ticket, $.25; Oct. 5, rope, $.33; Oct. 7, shoe laces, $.10. On Oct. 8 Fred's cash on hand was $.94. Make out the account and balance it. Does it balance?

5. Make up a problem like ex. 4 showing Mary's account for a week. Tell the amounts she received, giving the date for each item. Also tell the amounts spent with the date for each. Make out the account and balance it.

1. Jack wants to buy a Scout uniform that costs $8.50. He has already saved $5.25 toward the cost. If he can earn $.65 a week, how many weeks will it take him to earn the rest of the money?

This is a two-step problem.

First Step. In this step you have to answer this question: "How much money must Jack earn?" To find out, subtract $5.25 from $8.50, which gives $3.25. Jack still has to earn $3.25.

$$\begin{array}{r} \$8.50 \\ -\ 5.25 \\ \hline \$3.25 \end{array}$$

The question you have just answered is "How much money must Jack earn?" This is called the *hidden* question because it is not asked in the problem. When you read the problem you have to find this hidden question and answer it before you can work the second step.

Second Step. You are now ready to answer the question asked in the problem which is: "How many weeks will it take him to earn the rest of the money?" To find out, divide $3.25, the amount Jack must earn, by $.65, the amount he can earn in a week. Write $3.25 as 325¢ and $.65 as 65¢, as shown at the right. It will take Jack 5 weeks to earn the rest of the money.

$$\begin{array}{r} 5 \\ 65\overline{)325} \\ \underline{325} \end{array}$$

2. Jane needs 288 in. of gingham to make curtains and cushions for her room. How much will Jane have to pay for the gingham at $.65 a yard?

3. How much change should you get from $2.00 if you buy 6 gal. of gasoline at $.22 a gallon?

4. Bill's father paid $1.65 for his railroad ticket and $.85 for a ticket for each of 3 boys. How much did Bill's father pay for all the tickets?

5. Helen received these amounts of money last week: $.35, $.25, $.70, $.15, $.48. She spent these amounts of money during the week: $.10, $.07, $.28, $.15, $.29, $.40. Balance Helen's account and tell how much money she had left.



In each problem first find the hidden question and answer it. Then answer the question asked in the problem:

1. The subscription price of the magazine that Dick wants is $2.25 a year. He can get a two-year subscription for $3.75. How much will Dick save by taking the two-year subscription instead of subscribing for the magazine each year for two years?

2. Mr. Lee sells candy. He pays $.75 for a box of 24 candy bars. He sells the candy bars at $.05 each. How much more does he get for a box of candy bars than he pays for it?

3. Henry had 512 stamps in his collection. He gave his brother 43 stamps. Then Henry bought 125 more stamps. How many stamps did Henry have then?

4. George earned $1.25 one week, $.95 the second week, $1.15 the third week, and $.85 the fourth week. What was the average amount that George earned per week?

5. Mary and Alice paid $1.75 for roses and $.85 for candy as a birthday present for their mother. If they shared the cost equally, how much did each girl pay?

6. Dish towels cost $.35 each or 6 for $1.74. How much will you save on each towel by buying 6 towels at a time?

7. Helen has saved $2.50. Her mother gave her $.75. How much more money does Helen need to buy a sweater that costs $4.34?

8. What is the total cost of $\frac{3}{4}$ yd. of canvas at $.96 a yard, a paint brush for $.37, a tube of paint for $.38, and another tube of paint for $.47?

9. Peggy's mother buys 2 qt. of milk each day at $.15 a quart. What is the amount of her milk bill for 30 days?

10. Jim and his father left for the lake at 8 A.M. and arrived at 1 P.M. They drove the car 165 mi. in all. Find the average number of miles they drove per hour.

## INSECT ENEMIES

1. Many insects are enemies of man because each year they injure or destroy $\frac{1}{10}$ of our trees, grains, vegetables, and fruits. What fractional part of every crop grown are we able to save for our own use?

2. In this country the damage caused each year by insects plus the cost of trying to keep them under control amounts to a huge sum. There are about 140,000,000 people in the United States. If each of these people should pay the Government $22 a year, it would take the entire amount thus raised to pay for the damage caused by insects. What is the total amount of this damage per year? State this amount to the nearest billion dollars.

3. Fifty years ago the yearly damage by insects was about $\frac{1}{2}$ the present amount. See the answer to ex. 2. Ten years ago it was about $\frac{2}{3}$ the present amount. About how much per year did insect enemies cost us 50 years ago? 10 years ago?



4. In a recent year 9 of our states had a grasshopper plague to fight. Each of these states spent an average of $175,000 of its own money in this fight. The Government gave a total of $2,354,890 to help the states do this work. How much money all together was spent that year in the effort to keep the grasshopper plague under control?

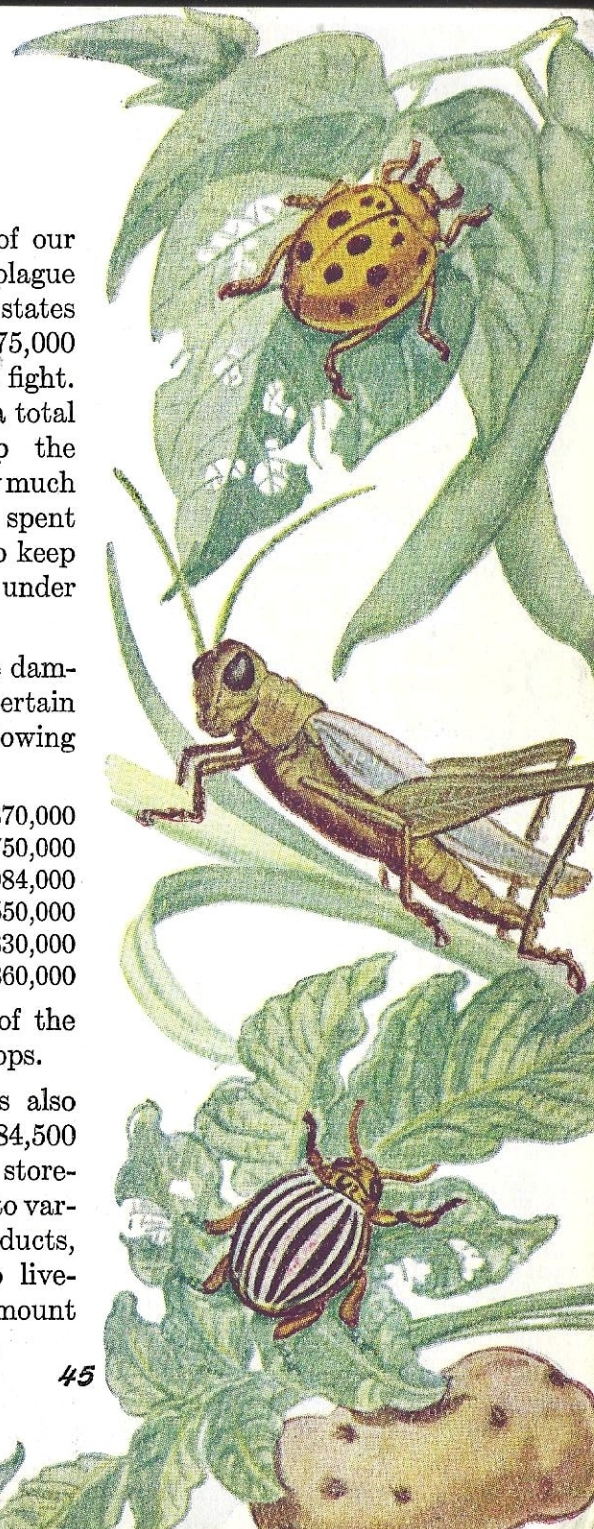
5. In a recent year the damage caused by insects to certain of our crops cost the following amounts:

| | |
|---|---|
| Apples . . . . | $32,870,000 |
| Corn . . . . . | 88,750,000 |
| Other Grains . . . | 74,984,000 |
| Cotton . . . . . | 164,550,000 |
| Potatoes . . . . | 25,830,000 |
| Other Vegetables . | 64,860,000 |

Find the total amount of the damage to the above crops.

6. In one year insects also caused a loss of $298,784,500 to food products in storehouses, of $128,960,400 to various kinds of forest products, and of $140,389,000 to livestock. Find the total amount of this loss for the year.





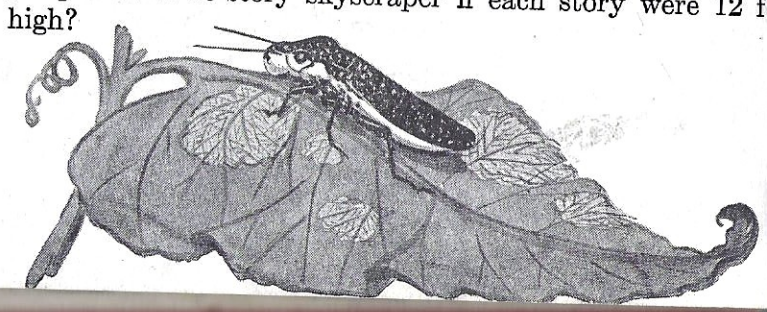
1. Insects are so destructive because there are so many of them. There are about 600,000 *different kinds* of insects. Suppose you should try to learn the names of all these kinds of insects. If you could learn the names of 25 insects each day, how many days would it take to learn the names of 600,000 kinds of insects? If you count 30 days to the month, how many months would it take? how many years?

2. It is estimated that in the world as a whole there are 25,000,000 insects for every square mile of land. At this rate, about how many insects would there be in a small state like Rhode Island which has a land area of 1067 sq. mi.? in New Jersey which has a land area of 7514 sq. mi.? in Indiana which has a land area of 36,045 sq. mi.?

3. In certain years much damage is done to trees by the *periodical cicada* or *17-year locust*. These locusts appear every 17 years in the North; during the intervening years they remain buried in the ground. In the town where Jack lives the 17-year locusts came the summer that he was 5 years old. How old will Jack be the next time the locusts come? the next two times they come after that?

4. In the South the locusts appear every 13 years instead of every 17 years as in the North. How many times would the 13-year locusts come during a period of 70 years if they make their first visit during the 13th year of this 70-year period?

5. When an insect is in danger, it often jumps or flies out of the way. A flea can jump 100 times as high as it is tall. If a boy 5 ft. tall could jump as well as a flea, he could jump 100 times his height. How high would that be? Could he jump over a 40-story skyscraper if each story were 12 ft. high?





Add and check the work:

| | | | | | |
|---|---|---|---|---|---|
| 1. | 2042 | 1669 | 1393 | 9047 | 7087 |
| | 5523 | 4005 | 5144 | 672 | 2935 |
| | 8295 | 917 | 6672 | 937 | 4465 |
| | 4937 | 1154 | 1826 | 8866 | 5709 |
| | 1607 | 5687 | 518 | 2426 | 560 |
| 2. | 7352 | 596 | 1844 | 6000 | 8415 |
| | 2678 | 903 | 7089 | 543 | 7534 |
| | 957 | 4117 | 451 | 2282 | 1160 |
| | 7460 | 2875 | 3667 | 5696 | 1821 |
| | 5848 | 998 | 8789 | 484 | 9028 |
| 3. | 3880 | 2186 | 3841 | 6715 | 4648 |
| | 609 | 885 | 2263 | 299 | 6284 |
| | 2147 | 927 | 1613 | 4000 | 1050 |
| | 6210 | 1946 | 842 | 635 | 439 |
| | 8043 | 4112 | 2060 | 2188 | 7575 |

Subtract and check the work:

| | | | | | |
|---|---|---|---|---|---|
| 4. | 83590 | 63937 | 30552 | 53000 | 17130 |
| | 77618 | 35893 | 11084 | 22573 | 10164 |
| 5. | 57017 | 82814 | 71916 | 74969 | 91284 |
| | 38475 | 67336 | 36432 | 15594 | 77519 |
| 6. | 86266 | 25961 | 60000 | 55338 | 60415 |
| | 47931 | 7669 | 37065 | 48527 | 15807 |
| 7. | 54084 | 92876 | 46095 | 65182 | 93038 |
| | 30258 | 72286 | 44728 | 45287 | 3759 |
| 8. | 40000 | 74813 | 33765 | 51034 | 97308 |
| | 6083 | 19238 | 16834 | 3436 | 55642 |

You will find 3 addition tests on page 49, which are called Addition Tests 1a, 1b, and 1c. Several more addition tests are given on other pages of this book. If you take these tests the *right way*, they will help you greatly to increase your ability to add rapidly and accurately.

When you take Addition Test 1a on page 49, the teacher will time you, allowing 5 min. for the test. At the end of the 5 min., you will stop work and the teacher will read the answers to the examples. There are 10 examples in Addition Test 1a, so your score will be 10 if you get all the examples right. If you get only 8 examples right, your score will be 8.

Suppose that you get a score of 8 today on Test 1a. Naturally you want to improve this score; this is the way to do it. Tomorrow the teacher will have the class take Addition Test 1b. Test 1b is like Test 1a since each test contains 10 examples of the same kind in column addition. The teacher will give Test 1b the same way as described above, allowing 5 min. for it. Try to improve your score this time, so that it will be better than the score of 8 which you got on Test 1a. Suppose you get a score of 9 on Test 1b.

A day or so later the teacher will give you Addition Test 1c. *Never take more than one test a day.* When you take Test 1c, try again to improve your score. Possibly you will get a score of 10 this time. But do not get discouraged if you fail to get 10 because you are sure to improve if you take each set of 3 tests in the way described above.

About a week later, the teacher will start you on a set of 3 subtraction tests which will help you better to subtract; see page 59. Later on, you will take some multiplication and division tests; see pages 65 and 81. All these tests are called *Improvement Tests* because they help you to improve your skill in computation. For a complete list of all the Improvement Tests, see the index of this book.

To the Teacher: See pages 50, 308, and 309 before giving Addition Test 1a.



Addition Test 1a. Time: 5 min.

| | | | | | |
|---|---|---|---|---|---|
| 1. | 435 | 332 | 351 | 314 | 122 |
| | 267 | 496 | 492 | 366 | 578 |
| | 453 | 645 | 278 | 698 | 475 |
| | 138 | 327 | 329 | 275 | 466 |
| 2. | 154 | 645 | 172 | 809 | 190 |
| | 499 | 126 | 807 | 550 | 596 |
| | 133 | 278 | 389 | 817 | 500 |
| | 104 | 348 | 824 | 269 | (10) 129 |

Addition Test 1b. Time: 5 min.

| | | | | | |
|---|---|---|---|---|---|
| 3. | 273 | 664 | 289 | 572 | 153 |
| | 564 | 255 | 244 | 154 | 469 |
| | 137 | 632 | 853 | 389 | 100 |
| | 237 | 156 | 547 | 148 | 465 |
| 4. | 169 | 213 | 387 | 279 | 794 |
| | 480 | 778 | 236 | 565 | 850 |
| | 474 | 276 | 181 | 149 | 751 |
| | 302 | 315 | 518 | 763 | (10) 212 |

Addition Test 1c. Time: 5 min.

| | | | | | |
|---|---|---|---|---|---|
| 5. | 122 | 345 | 386 | 265 | 236 |
| | 667 | 142 | 173 | 300 | 468 |
| | 303 | 544 | 921 | 422 | 143 |
| | 272 | 335 | 343 | 227 | 500 |
| 6. | 414 | 687 | 869 | 687 | 134 |
| | 251 | 374 | 160 | 403 | 307 |
| | 562 | 615 | 597 | 899 | 178 |
| | 236 | 202 | 324 | 617 | (10) 645 |

Improvement Tests.

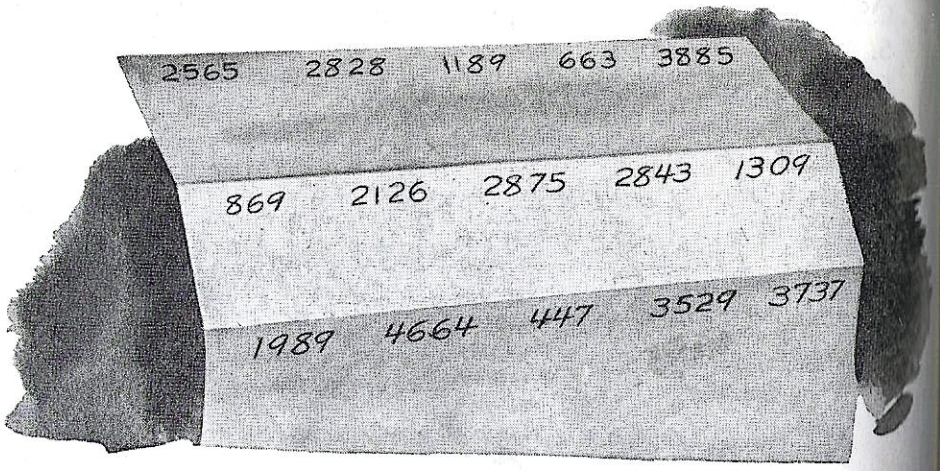
When you take an addition test like those on page 49, or a subtraction test like those on page 59, do not copy the examples. Instead lay a sheet of paper on the book with its edge *under* the top row of examples. Then write the answer to each example on the edge of the paper as shown in the illustration at the bottom of this page.

When you finish the answers to the first row of examples, fold the answers *under;* then write the answers to the second row along the folded edge, as shown below. Continue in this way for each row of examples. It saves time to fold the paper *before* taking the test, so as to form the creases. Each fold should be about 1 inch wide.

Folded paper cannot be used for tests in multiplication and division like those on pages 65 and 81. In taking such tests you should copy the examples on paper *before* the test begins. In copying, spread the examples over the paper so as to give room enough to work them.

Work on each test only the number of minutes given for that test, and stop work *at once at the end of that time.* You cannot compare your scores on the 3 tests in a set unless you allow exactly the same number of minutes for each test.

If you finish a test before the time to stop, check as many of the examples as you can in the time that is left.






| NUMBER OF EXAMPLES IN TEST | NUMBER OF EXAMPLES RIGHT | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| 4 | 0 | 3 | 5 | 8 | 10 | | | | | | | | | | | |
| 5 | 0 | 2 | 4 | 6 | 8 | 10 | | | | | | | | | | |
| 6 | 0 | 2 | 3 | 5 | 7 | 8 | 10 | | | | | | | | | |
| 7 | 0 | 1 | 3 | 4 | 6 | 7 | 9 | 10 | | | | | | | | |
| 8 | 0 | 1 | 3 | 4 | 5 | 6 | 8 | 9 | 10 | | | | | | | |
| 9 | 0 | 1 | 2 | 3 | 4 | 6 | 7 | 8 | 9 | 10 | | | | | | |
| 10 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | | | | | |
| 12 | 0 | 1 | 2 | 3 | 3 | 4 | 5 | 6 | 7 | 8 | 8 | 9 | 10 | | | |
| A → 15 | 0 | 1 | 1 | 2 | 3 | 3 | 4 | 5 | 5 | 6 | 7 | 7 | 8 | 9 | 9 | 10 |

B

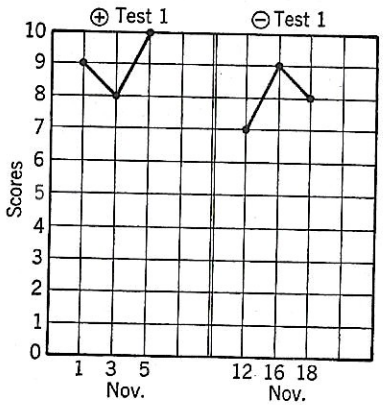
C

When a test contains 10 examples, it is easy to score it; if you get 9 examples right, your score is 9. When a test contains 15 examples, like the tests on page 59, your score is 10 if you get 15 examples right; but what is your score if you get 14 examples right, or only 12 right? The scoring table above answers this question.

Suppose you take a test containing 15 examples and that you get only 12 examples right. You find your score in the table like this: Since the test had 15 examples, look down the first column on the left side of the table until you come to the row marked 15 (shown by Arrow A). Then look along that row until you reach the column marked 12 at the top (shown by Arrow B) and you will find the number 8 (shown by Arrow C). This means that your score is 8 on that test.

In the third row of Subtraction Test 1a on page 59 you see a number in a circle like this: ⑮. This tells you that this test contains 15 examples, so it is not necessary to count to see how many examples the entire test contains.

The scoring table shown above is also printed on the inside of the back cover of this book.




RECORD OF JOE'S SCORES

The picture at the left shows Joe's scores on some tests that he took. This picture is called a *line graph.*

The top of the first graph is marked "⊕ Test 1." This line graph shows Joe's scores for Addition Tests 1a, 1b, and 1c, on page 49. These three tests make up Test 1. ⊕ means "addition." You see three heavy dots on the graph. The first dot is on the horizontal line marked 9; this means that Joe's score on Test 1a was 9. The first dot is also on the vertical line marked 1 at the bottom of the graph; this means that Joe took Test 1a on Nov. 1. The second dot shows Joe's score on Test 1b; his score was 8 and he took the test on Nov. 3. What was his score on Test 1c and on what date did he take that test? The dots on a line graph are connected by drawing lines between them.

The second graph headed "⊖ Test 1" gives Joe's scores on the 3 subtraction tests on page 59. ⊖ means "subtraction." What were his scores on these three tests and on what dates did he take them?

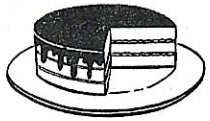
You should make a *Score Book* in which you keep a record of your scores on all the Improvement Tests that you take this school year. This book can be easily made from a few sheets of squared paper. Always watch your scores to see whether you are improving or not.

When you find your score on a test, count only the examples that are entirely right. An example that is partly finished does not count.

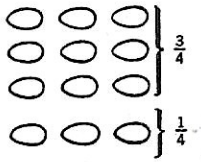


1. A fraction may have several different meanings which are illustrated below:

(1) The picture at the right shows $\frac{3}{4}$ of a cake. Here the fraction $\frac{3}{4}$ stands for *a part of one thing.* This same meaning of a fraction is illustrated by $\frac{3}{4}$ of an apple or $\frac{2}{3}$ of a cup of milk.



(2) Today Jack's mother used $\frac{3}{4}$ of a dozen eggs. Here the fraction $\frac{3}{4}$ stands for *a part of a group of things.* The group is 12 eggs. In this case you must find $\frac{3}{4}$ of 12 eggs, which equals 9 eggs. This same meaning of a fraction is illustrated by $\frac{2}{3}$ of 15 boys or $\frac{1}{2}$ of 36 inches.




(3) A fraction can also indicate division. The fraction $\frac{3}{4}$ means $3 \div 4$. Likewise, the fraction $\frac{5}{16}$ means $5 \div 16$.

2. In the fraction $\frac{2}{3}$, 2 is the *numerator* of the fraction and 3 is the *denominator* of the fraction. The numerator and denominator of a fraction are called the *terms* of the fraction.

3. You know that the fraction $\frac{2}{3}$ has the *same value* as the fraction $\frac{8}{12}$. A quick way to change the fraction $\frac{2}{3}$ to $\frac{8}{12}$ is to multiply both terms of $\frac{2}{3}$ by 4 as shown at *A*.

$$A.\ \frac{2}{3} = \frac{2 \times 4}{3 \times 4} = \frac{8}{12} \qquad B.\ \frac{8}{12} = \frac{8 \div 4}{12 \div 4} = \frac{2}{3}$$

You can change $\frac{8}{12}$ back to $\frac{2}{3}$ by dividing both terms of $\frac{8}{12}$ by 4 as shown above at *B*. When you change $\frac{8}{12}$ to $\frac{2}{3}$, you reduce $\frac{8}{12}$ to its *lowest terms.* A fraction is reduced to lowest terms by dividing both terms by the largest whole number that will divide both exactly.

> If you multiply or divide both terms of a fraction by the same number, you get another fraction having the same value.

1. Mrs. White bought 12 oz. of chopped meat. What part of a pound did she buy? You see that she bought $\frac{12}{16}$ lb., which equals $\frac{3}{4}$ lb. By what number do you divide both terms of $\frac{12}{16}$ to change it to $\frac{3}{4}$?

2. Jane needs 24 in. of cloth to finish the dress she is making. What part of a yard should she buy?

3. Each day Alice practices 40 min. on the piano. What part of an hour does she practice each day?

4. Jack and Tom together found 24 qt. of nuts in the woods. What part of a bushel is 24 qt.? 32 qt. = 1 bu.

5. Today Mr. King drove 100 mi. to Denver. He drove 60 mi. this morning and then stopped for lunch. What part of the trip did he complete before lunch?

6. Jack goes to college. He is at home only 3 months of the year. What part of the year is he at home?

In each exercise tell what number should be put in place of the star so that both fractions will be equal:

7. $\frac{1}{4} = \frac{*}{24}$ $\quad \frac{2}{3} = \frac{*}{12}$ $\quad \frac{5}{8} = \frac{*}{16}$ $\quad \frac{1}{5} = \frac{*}{10}$ $\quad \frac{1}{6} = \frac{*}{12}$

8. $\frac{7}{8} = \frac{*}{16}$ $\quad \frac{3}{4} = \frac{*}{12}$ $\quad \frac{5}{6} = \frac{*}{12}$ $\quad \frac{1}{2} = \frac{*}{10}$ $\quad \frac{3}{4} = \frac{*}{100}$

9. $\frac{2}{3} = \frac{*}{6}$ $\quad \frac{1}{2} = \frac{*}{12}$ $\quad \frac{5}{12} = \frac{*}{36}$ $\quad \frac{3}{10} = \frac{*}{60}$ $\quad \frac{2}{5} = \frac{*}{100}$

10. $\frac{3}{8} = \frac{*}{24}$ $\quad \frac{3}{4} = \frac{*}{48}$ $\quad \frac{7}{12} = \frac{*}{60}$ $\quad \frac{2}{3} = \frac{*}{24}$ $\quad \frac{7}{10} = \frac{*}{100}$

Reduce each fraction to lowest terms and tell by what number you divide both terms:

11. $\frac{6}{15}$ $\quad \frac{8}{10}$ $\quad \frac{16}{24}$ $\quad \frac{18}{36}$ $\quad \frac{8}{32}$ $\quad \frac{20}{25}$ $\quad \frac{9}{21}$ $\quad \frac{10}{18}$ $\quad \frac{12}{20}$

12. $\frac{15}{30}$ $\quad \frac{12}{36}$ $\quad \frac{9}{12}$ $\quad \frac{4}{32}$ $\quad \frac{24}{28}$ $\quad \frac{12}{18}$ $\quad \frac{6}{36}$ $\quad \frac{10}{30}$ $\quad \frac{24}{40}$

13. $\frac{8}{18}$ $\quad \frac{7}{21}$ $\quad \frac{16}{32}$ $\quad \frac{24}{48}$ $\quad \frac{18}{20}$ $\quad \frac{20}{60}$ $\quad \frac{10}{60}$ $\quad \frac{24}{36}$ $\quad \frac{45}{50}$

14. $\frac{9}{27}$ $\quad \frac{10}{16}$ $\quad \frac{20}{36}$ $\quad \frac{30}{60}$ $\quad \frac{35}{40}$ $\quad \frac{27}{45}$ $\quad \frac{65}{100}$ $\quad \frac{6}{30}$ $\quad \frac{40}{100}$

15. $\frac{18}{27}$ $\quad \frac{6}{21}$ $\quad \frac{14}{20}$ $\quad \frac{15}{60}$ $\quad \frac{16}{18}$ $\quad \frac{16}{40}$ $\quad \frac{30}{100}$ $\quad \frac{26}{30}$ $\quad \frac{75}{100}$



1. Fractions like $\frac{3}{4}$ and $\frac{2}{3}$, in which the numerator is smaller than the denominator, are called *proper fractions*. A proper fraction is less than 1 whole unit.

2. Fractions like $\frac{3}{3}$ and $\frac{5}{4}$, in which the numerator is equal to or larger than the denominator, are called *improper fractions*. An improper fraction is equal to or larger than 1 whole unit.

3. Numbers like $3\frac{1}{4}$ and $5\frac{2}{3}$, which consist of a whole number and a fraction, are called *mixed numbers*.

4. To change an improper fraction to a whole number or to a mixed number, divide the numerator by the denominator. For example, $\frac{8}{4} = 8 \div 4 = 2$; $\frac{15}{4} = 15 \div 4 = 3\frac{3}{4}$; and $\frac{18}{4} = 18 \div 4 = 4\frac{1}{2}$.

5. You know that $\frac{4}{1} = 4$. This shows that any whole number may be written in the form of a fraction with a denominator of 1. For example, 7 may be written as $\frac{7}{1}$. Tell how to write 5 in the form of a fraction.

6. Tell which of the fractions below are proper fractions and which are improper fractions:

$\frac{10}{12}$ $\quad \frac{4}{4}$ $\quad \frac{1}{3}$ $\quad \frac{15}{5}$ $\quad \frac{12}{16}$ $\quad \frac{20}{3}$ $\quad \frac{13}{12}$ $\quad \frac{15}{16}$ $\quad \frac{10}{10}$

Reduce each fraction to a whole number or to a mixed number. Be sure that the fraction in the answer is in lowest terms:

7. $\frac{12}{5}$ $\quad \frac{14}{8}$ $\quad \frac{6}{6}$ $\quad \frac{10}{3}$ $\quad \frac{15}{10}$ $\quad \frac{25}{5}$ $\quad \frac{14}{6}$ $\quad \frac{18}{10}$ $\quad \frac{24}{20}$

8. $\frac{16}{12}$ $\quad \frac{20}{4}$ $\quad \frac{8}{5}$ $\quad \frac{14}{10}$ $\quad \frac{27}{12}$ $\quad \frac{24}{16}$ $\quad \frac{48}{32}$ $\quad \frac{30}{5}$ $\quad \frac{25}{4}$

9. $\frac{10}{8}$ $\quad \frac{21}{9}$ $\quad \frac{9}{9}$ $\quad \frac{32}{12}$ $\quad \frac{20}{10}$ $\quad \frac{16}{4}$ $\quad \frac{19}{6}$ $\quad \frac{45}{30}$ $\quad \frac{40}{16}$

These are the answers some pupils gave to a set of examples in fractions. Reduce each answer to its simplest form:

10. $\frac{4}{8}$ $\quad \frac{8}{5}$ $\quad \frac{8}{6}$ $\quad 2\frac{3}{6}$ $\quad 3\frac{4}{4}$ $\quad 4\frac{5}{4}$ $\quad 6\frac{10}{8}$

11. $\frac{18}{12}$ $\quad \frac{4}{6}$ $\quad \frac{8}{12}$ $\quad 5\frac{8}{16}$ $\quad 2\frac{11}{10}$ $\quad 6\frac{8}{8}$ $\quad 3\frac{17}{16}$

12. $\frac{20}{16}$ $\quad \frac{12}{21}$ $\quad \frac{9}{8}$ $\quad 6\frac{15}{10}$ $\quad 2\frac{12}{16}$ $\quad 7\frac{5}{4}$ $\quad 2\frac{10}{5}$

1. John walked $\frac{1}{2}$ mi. to school, $1\frac{3}{4}$ mi. to the ball park, and $1\frac{3}{8}$ mi. to get home. How many miles did John walk?

The fractions you add must have like denominators, so you cannot add *halves, fourths* and *eighths*. You can add $\frac{1}{2}$, $\frac{3}{4}$, and $\frac{3}{8}$ if you change them all to *eighths*, as shown at the right. The sum of the fractions is $\frac{13}{8}$. Change $\frac{13}{8}$ to $1\frac{5}{8}$; then add $1\frac{5}{8}$ to 2, which gives $3\frac{5}{8}$. John walked $3\frac{5}{8}$ mi. Check the work by going over it.

$$\begin{array}{rcl} \frac{1}{2} & = & \frac{4}{8} \\ 1\frac{3}{4} & = & 1\frac{6}{8} \\ 1\frac{3}{8} & = & 1\frac{3}{8} \\ \hline & & 2\frac{13}{8} = 3\frac{5}{8} \end{array}$$

> To add fractions with unlike denominators, first change them to fractions with like denominators.

2. Study these exercises:

$$\begin{array}{r} \frac{3}{4} \\ \frac{3}{4} \\ \hline \frac{6}{4} = 1\frac{2}{4} = 1\frac{1}{2} \end{array} \qquad \begin{array}{r} 1\frac{5}{16} \\ 2\frac{11}{16} \\ \hline 3\frac{16}{16} = 4 \end{array} \qquad \begin{array}{r} 4\frac{2}{3} = 4\frac{4}{6} \\ 1\frac{5}{6} = 1\frac{5}{6} \\ \hline 5\frac{9}{6} = 6\frac{3}{6} = 6\frac{1}{2} \end{array}$$

Add. Check the work by going over it:

| | | | | | | |
|---|---|---|---|---|---|---|
| 3. $3\frac{1}{4}$ | $6$ | $2\frac{3}{10}$ | $5\frac{1}{4}$ | $8\frac{3}{8}$ | $3\frac{7}{16}$ | $7\frac{1}{2}$ |
| $4\frac{1}{4}$ | $4\frac{3}{8}$ | $4\frac{1}{10}$ | $2\frac{1}{2}$ | $4\frac{1}{4}$ | $9\frac{3}{8}$ | $8\frac{1}{3}$ |
| 4. $2\frac{1}{4}$ | $4\frac{3}{16}$ | $3\frac{1}{10}$ | $2\frac{1}{2}$ | $6\frac{5}{6}$ | $5\frac{4}{5}$ | $7\frac{5}{8}$ |
| $3\frac{5}{8}$ | $2\frac{7}{16}$ | $7\frac{9}{10}$ | $4\frac{1}{3}$ | $9\frac{5}{6}$ | $1\frac{7}{10}$ | $4\frac{3}{16}$ |
| 5. $1\frac{2}{3}$ | $8\frac{2}{3}$ | $2\frac{3}{8}$ | $1\frac{1}{2}$ | $3\frac{4}{5}$ | $6\frac{7}{8}$ | $2\frac{7}{10}$ |
| $4\frac{1}{12}$ | $4\frac{5}{6}$ | $1\frac{7}{8}$ | $4\frac{3}{10}$ | $8\frac{1}{2}$ | $2\frac{11}{16}$ | $2\frac{3}{10}$ |
| 6. $4\frac{1}{6}$ | $8\frac{5}{8}$ | $6\frac{7}{12}$ | $2\frac{9}{16}$ | $4\frac{7}{10}$ | $2\frac{1}{3}$ | $3\frac{3}{4}$ |
| $3\frac{1}{2}$ | $2\frac{1}{4}$ | $2\frac{2}{3}$ | $2\frac{1}{2}$ | $1\frac{4}{5}$ | $4\frac{1}{3}$ | $3\frac{1}{8}$ |
| $4\frac{1}{3}$ | $3\frac{1}{2}$ | $1\frac{1}{2}$ | $5\frac{3}{16}$ | $3\frac{1}{2}$ | $6\frac{1}{6}$ | $7\frac{9}{16}$ |



1. In the basket on his bicycle John carried three packages to the post office. Their weights were $2\frac{3}{4}$ lb., $3\frac{5}{8}$ lb., and $1\frac{1}{2}$ lb. How many pounds did he carry in the basket?

2. Last Saturday Tom worked $2\frac{1}{2}$ hr. in Mr. Lee's yard and $1\frac{3}{4}$ hr. in Mr. White's garden. How many hours in all did Tom work for these men?

Add. Check the work by going over it:

| | | | | | | |
|---|---|---|---|---|---|---|
| 3. $\frac{1}{6}$ | $7\frac{5}{8}$ | $6\frac{11}{16}$ | $4\frac{3}{5}$ | $1\frac{3}{4}$ | $5\frac{5}{12}$ | $3\frac{1}{4}$ |
| $\frac{5}{8}$ | $8\frac{1}{2}$ | $5\frac{11}{16}$ | $4\frac{3}{10}$ | $3\frac{2}{3}$ | $2\frac{5}{6}$ | $9\frac{2}{5}$ |
| 4. $\frac{11}{16}$ | $1\frac{1}{2}$ | $7\frac{1}{3}$ | $4\frac{1}{2}$ | $6\frac{3}{4}$ | $2\frac{1}{5}$ | $1\frac{7}{16}$ |
| $\frac{3}{4}$ | $2\frac{5}{6}$ | $8\frac{3}{4}$ | $3\frac{4}{5}$ | $2\frac{3}{8}$ | $2\frac{3}{10}$ | $1\frac{3}{8}$ |
| $\frac{3}{8}$ | $1\frac{11}{12}$ | $6\frac{7}{12}$ | $5\frac{9}{10}$ | $2\frac{7}{16}$ | $1\frac{1}{2}$ | $1\frac{3}{4}$ |
| 5. $\frac{1}{16}$ | $3\frac{1}{2}$ | $5\frac{7}{10}$ | $9\frac{1}{8}$ | $1\frac{13}{16}$ | $7\frac{11}{12}$ | $3\frac{3}{4}$ |
| $\frac{5}{8}$ | $6\frac{1}{2}$ | $2\frac{1}{2}$ | $1\frac{1}{2}$ | $4\frac{3}{8}$ | $5\frac{5}{6}$ | $4\frac{7}{16}$ |
| $\frac{1}{16}$ | $2\frac{5}{8}$ | $3\frac{2}{5}$ | $8\frac{1}{4}$ | $1\frac{1}{16}$ | $2\frac{1}{3}$ | $4\frac{1}{2}$ |

1. Mary plans to practice on the piano $5\frac{1}{2}$ hr. a week. She has already practiced $3\frac{1}{4}$ hr. this week. How many more hours should she practice this week?

You cannot subtract $\frac{1}{4}$ from $\frac{1}{2}$ as they stand because they have different denominators. Change $\frac{1}{2}$ to $\frac{2}{4}$. Then subtract $\frac{1}{4}$ from $\frac{2}{4}$. Mary should practice $2\frac{1}{4}$ hr. more this week.

$$\begin{array}{r} 5\frac{1}{2} = 5\frac{2}{4} \\ 3\frac{1}{4} = 3\frac{1}{4} \\ \hline 2\frac{1}{4} \end{array}$$

2. Jane weighs $87\frac{3}{4}$ lb. and Betty weighs $85\frac{1}{8}$ lb. How many pounds less does Betty weigh than Jane?

3. Mary bought a remnant containing $2\frac{1}{3}$ yd. of cloth. She used $1\frac{5}{6}$ yd. of this cloth to make a skirt. How much cloth did she have left?

Subtract. Check the work by going over it:

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 4. | $3\frac{13}{16}$ | $4\frac{3}{4}$ | $6\frac{5}{6}$ | $5\frac{7}{10}$ | $3\frac{9}{10}$ | $1\frac{1}{2}$ | $4\frac{5}{8}$ |
| | $1\frac{9}{16}$ | $2\frac{1}{4}$ | $4\frac{1}{6}$ | $3\frac{1}{2}$ | $1\frac{3}{5}$ | $1\frac{1}{3}$ | $\frac{3}{8}$ |
| 5. | $2\frac{1}{3}$ | $7\frac{1}{2}$ | $4\frac{7}{8}$ | $1\frac{15}{16}$ | $4\frac{2}{3}$ | $6\frac{7}{8}$ | $3\frac{2}{3}$ |
| | $2\frac{1}{4}$ | $4\frac{1}{5}$ | $3\frac{1}{4}$ | $1\frac{1}{4}$ | $\frac{1}{2}$ | $5\frac{1}{2}$ | $2\frac{1}{6}$ |
| 6. | $3\frac{2}{5}$ | $2\frac{9}{16}$ | $3\frac{5}{8}$ | $7\frac{7}{16}$ | $5\frac{7}{8}$ | $4\frac{2}{3}$ | $6\frac{11}{12}$ |
| | $3$ | $2\frac{3}{16}$ | $2\frac{1}{4}$ | $5\frac{1}{8}$ | $\frac{3}{8}$ | $3\frac{1}{4}$ | $4\frac{5}{12}$ |
| 7. | $6\frac{3}{5}$ | $3\frac{5}{6}$ | $4\frac{1}{2}$ | $2\frac{1}{3}$ | $8\frac{1}{2}$ | $2\frac{9}{10}$ | $7\frac{3}{4}$ |
| | $4\frac{1}{10}$ | $3\frac{1}{12}$ | $3\frac{5}{16}$ | $1\frac{1}{8}$ | $7\frac{2}{5}$ | $\frac{2}{5}$ | $5\frac{1}{12}$ |
| 8. | $9\frac{1}{2}$ | $1\frac{7}{16}$ | $3\frac{3}{4}$ | $6\frac{5}{12}$ | $4\frac{3}{4}$ | $7\frac{1}{2}$ | $5\frac{4}{5}$ |
| | $7\frac{3}{10}$ | $\frac{3}{8}$ | $1\frac{1}{3}$ | $3\frac{1}{4}$ | $4\frac{5}{8}$ | $5\frac{5}{12}$ | $3\frac{7}{10}$ |
| 9. | $3\frac{7}{16}$ | $8\frac{3}{8}$ | $5\frac{1}{3}$ | $9\frac{5}{12}$ | $4\frac{1}{2}$ | $2\frac{3}{4}$ | $6\frac{3}{5}$ |
| | $2\frac{1}{4}$ | $2\frac{1}{4}$ | $2\frac{1}{6}$ | $5\frac{1}{6}$ | $\frac{3}{8}$ | $2\frac{1}{2}$ | $2\frac{1}{2}$ |



Subtraction Test 1a. Time: 4 min.

| | | | | | |
|---|---|---|---|---|---|
| 1. | 6058 | 9183 | 3672 | 4234 | 5251 |
| | 3493 | 6355 | 2483 | 3571 | 1366 |
| 2. | 7691 | 4000 | 7759 | 4412 | 9605 |
| | 6822 | 1874 | 4884 | 1569 | 8296 |
| 3. | 5604 | 7416 | 6280 | 9348 | 7213 |
| | 3615 | 2752 | 5833 | 5819 | (15) 3476 |

Subtraction Test 1b. Time: 4 min.

| | | | | | |
|---|---|---|---|---|---|
| 4. | 8094 | 9417 | 5031 | 7000 | 9782 |
| | 6109 | 4692 | 2584 | 5427 | 8847 |
| 5. | 2139 | 2528 | 6653 | 7018 | 5297 |
| | 1577 | 1591 | 4784 | 3038 | 1419 |
| 6. | 4308 | 8231 | 3300 | 9512 | 4642 |
| | 2542 | 5302 | 1219 | 7765 | (15) 3076 |

Subtraction Test 1c. Time: 4 min.

| | | | | | |
|---|---|---|---|---|---|
| 7. | 7359 | 9406 | 5288 | 6629 | 6712 |
| | 4774 | 2577 | 3329 | 4285 | 1826 |
| 8. | 8000 | 2875 | 6171 | 9218 | 4080 |
| | 4351 | 1776 | 4782 | 5854 | 1213 |
| 9. | 5589 | 3743 | 5653 | 7041 | 9342 |
| | 4962 | 2186 | 3809 | 3476 | (15) 7347 |

Improvement Tests.

1. Mr. Best asked Jim to take \$5 to the bank and have it changed into 4 dollars and 4 quarters. Does $\$5 = \$4\frac{4}{4}$?

2. Ann has 3 dollars and 1 quarter. If she changes 1 dollar into quarters, how many dollars and quarters will she have then? Does $\$3\frac{1}{4} = \$2\frac{5}{4}$?

3. Bill has 4 dollars and 3 dimes. If he changes 1 dollar into dimes, how many dollars and dimes will he have then? Does $\$4\frac{3}{10} = \$3\frac{13}{10}$?

4. Mr. Lee has 6 dollars and 1 half dollar. If he changes 1 dollar into half dollars, how many dollars and half dollars will he have then? Does $\$6\frac{1}{2} = \$5\frac{3}{2}$?

Tell what numbers should be put in place of the stars:

5. \$3 equals \$2 and * quarters. $3 = 2\frac{*}{4}$.
6. \$5 equals \$4 and * half dollars. $5 = 4\frac{*}{2}$.
7. \$10 equals \$9 and * quarters. $10 = 9\frac{*}{4}$.
8. $\$4\frac{1}{2}$ equals \$3 and * half dollars. $4\frac{1}{2} = 3\frac{*}{2}$.
9. $\$8\frac{1}{4}$ equals \$7 and * quarters. $8\frac{1}{4} = 7\frac{*}{4}$.
10. \$10 equals \$9 and * dimes. $10 = 9\frac{*}{10}$.
11. $\$2\frac{1}{2}$ equals \$1 and * dimes. $2\frac{1}{2} = 1\frac{*}{10}$.
12. $\$6\frac{1}{2}$ equals \$5 and * quarters. $6\frac{1}{2} = 5\frac{*}{4}$.

| | | |
|---|---|---|
| 13. $9 = 8\frac{*}{3}$ | $6\frac{3}{8} = 5\frac{*}{8}$ | $3\frac{3}{4} = 3\frac{6}{8} = 2\frac{*}{8}$ |
| 14. $7 = 6\frac{*}{4}$ | $9\frac{1}{6} = 8\frac{*}{6}$ | $7\frac{2}{3} = 7\frac{4}{6} = 6\frac{*}{6}$ |
| 15. $4 = 3\frac{*}{6}$ | $5\frac{2}{3} = 4\frac{*}{3}$ | $8\frac{2}{5} = 8\frac{*}{10} = 7\frac{*}{10}$ |
| 16. $8 = 7\frac{*}{8}$ | $4\frac{3}{4} = 3\frac{*}{4}$ | $4\frac{1}{2} = 4\frac{*}{12} = 3\frac{*}{12}$ |
| 17. $3 = 2\frac{*}{10}$ | $2\frac{1}{2} = 1\frac{*}{2}$ | $3\frac{7}{8} = 3\frac{*}{16} = 2\frac{*}{16}$ |
| 18. $6 = 5\frac{*}{16}$ | $2\frac{7}{12} = 1\frac{*}{12}$ | $4\frac{5}{6} = 4\frac{*}{12} = 3\frac{*}{12}$ |
| 19. $5 = 4\frac{*}{12}$ | $3\frac{1}{2} = 2\frac{*}{2}$ | $3\frac{1}{2} = 3\frac{*}{4} = 2\frac{*}{4}$ |
| 20. $8 = 7\frac{*}{5}$ | $6\frac{1}{4} = 5\frac{*}{4}$ | $2\frac{1}{4} = 2\frac{*}{8} = 1\frac{*}{8}$ |



1. Bill was $57\frac{1}{2}$ in. tall in June. In September he was $59\frac{1}{4}$ in. tall. How many inches did he grow in 3 mo.?

2. Bill weighed $85\frac{5}{8}$ lb, in June. In September he weighed $89\frac{1}{4}$ lb. How many pounds did he gain during the summer?

You cannot subtract *eighths* from *fourths*, so change $89\frac{1}{4}$ to $89\frac{2}{8}$. Since you cannot subtract $\frac{5}{8}$ from $\frac{2}{8}$, change $89\frac{2}{8}$ to $88\frac{10}{8}$. Then subtract $85\frac{5}{8}$ from $88\frac{10}{8}$. Bill gained $3\frac{5}{8}$ lb.

$$\begin{array}{rcrcr} 89\frac{1}{4} & = & 89\frac{2}{8} & = & 88\frac{10}{8} \\ 85\frac{5}{8} & = & 85\frac{5}{8} & = & 85\frac{5}{8} \\ \hline & & & & 3\frac{5}{8} \end{array}$$

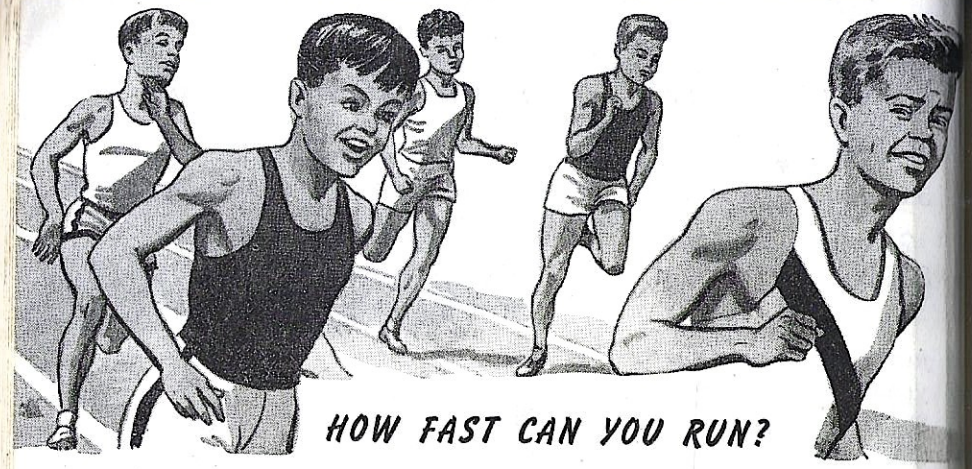
3. Bill's sister Mary was $54\frac{3}{4}$ in. tall in June. In September she was $55\frac{1}{2}$ in. tall. How many inches taller was Mary in September than in June?

4. In June before school closed Mary weighed $72\frac{1}{2}$ lb. In September when school opened she weighed 77 lb. How many pounds did Mary gain during the summer?

Subtract. Check the work by going over it:

| | | | | | | |
|---|---|---|---|---|---|---|
| 5. $6\frac{1}{2}$ | $2\frac{1}{4}$ | $5\frac{1}{8}$ | $4\frac{3}{16}$ | 8 | $7\frac{1}{4}$ | 9 |
| $4\frac{2}{3}$ | $1\frac{1}{2}$ | $3\frac{1}{2}$ | $2\frac{1}{2}$ | $5\frac{2}{3}$ | $5\frac{5}{8}$ | $\frac{5}{6}$ |
| 6. $4\frac{1}{5}$ | $8\frac{1}{6}$ | $6\frac{1}{2}$ | $4\frac{2}{5}$ | $5\frac{1}{4}$ | $2\frac{1}{6}$ | $8\frac{1}{8}$ |
| $1\frac{7}{10}$ | $3\frac{1}{2}$ | $5\frac{7}{12}$ | $2\frac{1}{2}$ | $1\frac{7}{8}$ | $1\frac{2}{3}$ | $6\frac{3}{16}$ |
| 7. $2\frac{3}{4}$ | $4\frac{7}{10}$ | $3\frac{3}{4}$ | $5\frac{1}{2}$ | $6\frac{1}{3}$ | $3\frac{7}{16}$ | $6\frac{1}{8}$ |
| $\frac{7}{8}$ | $3\frac{4}{5}$ | $1\frac{5}{12}$ | $2\frac{3}{4}$ | $3\frac{5}{6}$ | $1\frac{3}{4}$ | $2\frac{3}{4}$ |
| 8. $4\frac{1}{4}$ | $8\frac{1}{3}$ | $3\frac{1}{2}$ | $9\frac{1}{2}$ | $4\frac{1}{2}$ | $5\frac{1}{2}$ | $2\frac{1}{2}$ |
| $2\frac{7}{16}$ | $6\frac{3}{4}$ | $\frac{13}{16}$ | $4\frac{7}{8}$ | $3\frac{7}{10}$ | $3\frac{5}{6}$ | $1\frac{4}{5}$ |
| 9. $6\frac{3}{8}$ | $5\frac{1}{8}$ | $4\frac{1}{4}$ | $7\frac{1}{10}$ | $2\frac{3}{8}$ | $4\frac{1}{3}$ | $9\frac{3}{10}$ |
| $4\frac{1}{2}$ | $4\frac{15}{16}$ | $1\frac{3}{8}$ | $4\frac{3}{5}$ | $\frac{13}{16}$ | $2\frac{5}{12}$ | $7\frac{1}{2}$ |

Subtraction with unlike denominators when the fraction in the minuend is less than that in the subtrahend.



## HOW FAST CAN YOU RUN?

1. Tom can run 50 yd. in $8\frac{4}{5}$ sec. It takes Jack $9\frac{3}{10}$ sec. to run the same distance. How much longer does it take Jack than Tom?

2. Helen can run 50 yd. in $9\frac{1}{2}$ sec. Betty can do it in $9\frac{1}{5}$ sec. How much less time does it take Betty than Helen?

3. Ann is 12 yr. old. She can run 50 yd. in $8\frac{3}{5}$ sec. The average time for a girl of her age to run 50 yd. is 9 sec. How many seconds faster is Ann's time than the average time?

Subtract. Check the work by going over it:

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 4. | $4\frac{13}{16}$ | $5\frac{1}{4}$ | $8$ | $1\frac{1}{5}$ | $3\frac{1}{16}$ | $7\frac{1}{6}$ | $9\frac{1}{6}$ |
| | $2\frac{1}{8}$ | $3\frac{1}{3}$ | $6\frac{1}{6}$ | $\frac{9}{10}$ | $2\frac{3}{4}$ | $3\frac{11}{12}$ | $4\frac{2}{3}$ |
| 5. | $5\frac{1}{4}$ | $4\frac{7}{16}$ | $7\frac{7}{12}$ | $5\frac{1}{3}$ | $4\frac{1}{2}$ | $3\frac{2}{3}$ | $9\frac{1}{2}$ |
| | $3\frac{3}{8}$ | $2\frac{1}{2}$ | $5\frac{2}{3}$ | $2\frac{1}{2}$ | $3\frac{3}{5}$ | $1\frac{3}{4}$ | $2\frac{3}{4}$ |
| 6. | $4\frac{11}{12}$ | $3\frac{1}{2}$ | $1\frac{3}{16}$ | $5\frac{1}{8}$ | $9\frac{1}{12}$ | $2\frac{3}{10}$ | $7\frac{1}{2}$ |
| | $2\frac{1}{3}$ | $\frac{5}{8}$ | $\frac{5}{8}$ | $2\frac{1}{4}$ | $7\frac{1}{4}$ | $\frac{3}{5}$ | $4\frac{2}{3}$ |
| 7. | $8\frac{1}{10}$ | $9\frac{1}{2}$ | $5\frac{3}{8}$ | $4\frac{3}{10}$ | $8\frac{1}{4}$ | $3\frac{1}{2}$ | $4\frac{7}{12}$ |
| | $4\frac{1}{2}$ | $7\frac{5}{12}$ | $2\frac{1}{8}$ | $3\frac{2}{5}$ | $\frac{9}{16}$ | $2\frac{11}{12}$ | $2\frac{1}{6}$ |
| 8. | $6\frac{1}{4}$ | $4\frac{1}{5}$ | $5\frac{1}{3}$ | $2\frac{5}{8}$ | $2\frac{4}{5}$ | $8\frac{1}{3}$ | $7\frac{11}{16}$ |
| | $2\frac{5}{8}$ | $3\frac{1}{2}$ | $2\frac{7}{8}$ | $1\frac{15}{16}$ | $2\frac{1}{2}$ | $6\frac{11}{12}$ | $2\frac{3}{4}$ |





1. Jane's mother made Jane a new dress. She bought 3 yd. of material at \$.75 a yard, buttons for \$.35, and a pattern for \$.45. She could have bought a dress at the store for \$5.70. How much did she save by making the dress?

This is a three-step problem.

First Step. You have to answer the first *hidden* question which is: "How much did the material cost?" The material cost \$2.25.

$$\begin{array}{r} \$\ .75 \\ 3 \\ \hline \$2.25 \end{array}$$

Second Step. You have to answer the second *hidden question* which is: "How much in all did the material, buttons, and pattern cost?" By adding the numbers at the right you find that all these things cost \$3.05.

$$\begin{array}{r} \$2.25 \\ .35 \\ .45 \\ \hline \$3.05 \end{array}$$

Third Step. You are now ready to answer the question asked in the problem which is: "How much did she save by making the dress?" The amount saved by making the dress was \$2.65.

$$\begin{array}{r} \$5.70 \\ 3.05 \\ \hline \$2.65 \end{array}$$

In a three-step problem you must answer three questions. Two questions are *hidden questions* which you must answer before you can answer the question asked in the problem.

2. Mary bought 2 cans of peaches at 35¢ a can and 3 cans of corn at 13¢ a can. How much was her bill?

3. Tom is earning money to buy a pair of basketball shoes that cost \$2.89. Last week he worked $1\frac{1}{2}$ hr. on Monday, $\frac{3}{4}$ hr. on Tuesday, $1\frac{1}{4}$ hr. on Friday and $2\frac{1}{2}$ hr. on Saturday. He received 40¢ an hour. How much more money does he need to earn to buy the shoes?

4. Mr. Smith is driving his car to Chicago, a distance of 512 mi. He says that the trip will take about 16 hr. driving time. When he left home in the morning the speedometer of his car registered 4286 mi. When he stopped for the night the speedometer registered 4567 mi. How many miles per hour will Mr. Smith have to drive in order to complete the rest of the trip in 7 hr.?

There are two hidden questions in each problem on this page. In working each problem first find the hidden questions and answer them. Then answer the question asked in the problem:

1. George's father bought 6 gal. of gasoline at \$.22 a gallon and a quart of oil for \$.35. He gave the man \$2.00. How much change did he receive?

2. Alice bought $\frac{1}{2}$ lb. of hard candy at \$.40 a pound, a bag of peanuts for \$.10, and 3 bars of chocolate at \$.10 a bar. How much in all did these things cost?

3. Our class wants to buy a set of books that cost \$19.75 and a picture that costs \$6.50. We are going to give a play to earn the money. There are 25 pupils in our class. If each pupil sells the same number of tickets, how many tickets at 15¢ each should each pupil sell?

4. At a sale Jane saw a dress marked down from \$6.50 to \$4.49 and another dress marked down from \$4.95 to \$3.50. On which dress was the saving larger and how much larger?

5. Bob is saving money for a radio that costs \$12.50. He has already saved \$5.70. He earns \$.50 a week helping Mrs. White and he receives an allowance of \$.35 a week from his father. If he saves all his allowance and earnings, how many weeks will it take him to save enough more to buy the radio?

6. The Science Club wants to buy a pair of field glasses marked \$7.00 and a magnifying glass marked \$1.80. The store will sell these things to the club at "$\frac{1}{4}$ off" which means $\frac{1}{4}$ less than the regular price. At $\frac{1}{4}$ off how much will both these things cost the club?

7. Bill and Tom earned \$3.30 helping Mrs. Brown. They shared the money equally. With his money Bill bought a pocket knife for \$.69 and a belt for \$.42. How much did Bill have left?

8. How much change did Helen get from \$2.00 after buying $\frac{3}{4}$ yd. of lace at \$1.00 a yard and buttons for \$.39?



Multiplication Test 1a. Time: 4 min. after copying.

| | | | | | |
|---|---|---|---|---|---|
| 1. 476 | 754 | 593 | 938 | 218 | 826 |
| 62 | 43 | 28 | 75 | 36 | ⑥ 84 |

Multiplication Test 1b. Time: 4 min. after copying.

| | | | | | |
|---|---|---|---|---|---|
| 2. 276 | 634 | 752 | 695 | 193 | 619 |
| 47 | 83 | 96 | 25 | 64 | ⑥ 39 |

Multiplication Test 1c. Time: 4 min. after copying.

| | | | | | |
|---|---|---|---|---|---|
| 3. 327 | 946 | 649 | 645 | 715 | 189 |
| 32 | 56 | 18 | 27 | 89 | ⑥ 73 |

Improvement Tests.

## MIXED PRACTICE

Find the answers:

| | | |
|---|---|---|
| 4. 287 × 408 | 34 × 3879 | $5 - 1\frac{1}{2}$ |
| 5. 20,443 ÷ 36 | 38,000 ÷ 55 | $\frac{2}{3} \times 18$ |
| 6. 10,775 ÷ 19 | 65,988 ÷ 78 | $4\frac{3}{4} + 6\frac{3}{8}$ |
| 7. 27,968 ÷ 64 | 19,007 ÷ 25 | $4\frac{1}{2} - 1\frac{5}{6}$ |
| 8. \$6.95 + \$3.98 | 8009 + 2994 | $2\frac{7}{8} + \frac{3}{8}$ |
| 9. 1000 − 653 | 38,205 − 589 | $6\frac{2}{3} - 5$ |
| 10. 270 × 937 | 20,482 ÷ 38 | $\frac{3}{4} \times 24$ |
| 11. 12,654 ÷ 24 | 89 × 4007 | $\frac{7}{16} + \frac{3}{4}$ |
| 12. 94,564 ÷ 47 | 86,387 ÷ 43 | $\frac{7}{10} + 3\frac{4}{5}$ |
| 13. 826 + 174 | 5000 − 1924 | $\frac{1}{2} \times 48$ |
| 14. 40 × 9107 | 17,280 ÷ 30 | $5\frac{1}{2} - 2\frac{3}{8}$ |
| 15. 20,000 − 309 | 25,122 ÷ 53 | $\frac{5}{6} \times 30$ |
| 16. 16,375 ÷ 25 | 6000 − 2847 | $3\frac{5}{6} - 1\frac{2}{3}$ |

1. Find the sum of $\frac{3}{4}$ and $\frac{5}{6}$.

To add $\frac{3}{4}$ and $\frac{5}{6}$ you must change them to fractions having like denominators. When fractions have like denominators they are said to have a *common denominator*. You can find a common denominator for $\frac{3}{4}$ and $\frac{5}{6}$ by multiplying the denominators 4 and 6 together, which gives 24. How do you change $\frac{3}{4}$ to $\frac{18}{24}$? Explain the rest of the work.

$$\begin{array}{rcl} \frac{3}{4} & = & \frac{18}{24} \\ \frac{5}{6} & = & \frac{20}{24} \\ \hline & & \frac{38}{24} = 1\frac{14}{24} = 1\frac{7}{12} \end{array}$$

In the work above the common denominator is 24. You can also add $\frac{3}{4}$ and $\frac{5}{6}$ by using a common denominator of 12; 12 is called the *least common denominator* because it is the smallest number that contains both 4 and 6. By using 12 as the common denominator you have smaller numbers to work with and the work is a little shorter.

$$\begin{array}{rcl} \frac{3}{4} & = & \frac{9}{12} \\ \frac{5}{6} & = & \frac{10}{12} \\ \hline & & \frac{19}{12} = 1\frac{7}{12} \end{array}$$

Add. Find the least common denominator:

| | | | | | | |
|---|---|---|---|---|---|---|
| 2. $\frac{1}{6}$ | $6\frac{1}{4}$ | $4\frac{5}{6}$ | $4\frac{1}{8}$ | $8\frac{1}{6}$ | $3\frac{3}{4}$ | $7\frac{1}{4}$ |
| $\frac{1}{4}$ | $2\frac{3}{10}$ | $7\frac{1}{8}$ | $4\frac{1}{12}$ | $6\frac{7}{8}$ | $4\frac{1}{10}$ | $3\frac{5}{6}$ |
| 3. $\frac{3}{4}$ | $1\frac{5}{6}$ | $3\frac{1}{6}$ | $5\frac{3}{8}$ | $1\frac{7}{10}$ | $2\frac{3}{4}$ | $3\frac{1}{6}$ |
| $\frac{9}{10}$ | $1\frac{7}{10}$ | $8\frac{1}{8}$ | $4\frac{7}{12}$ | $9\frac{5}{8}$ | $2\frac{3}{10}$ | $6\frac{1}{10}$ |
| 4. $\frac{1}{8}$ | $6\frac{1}{6}$ | $1\frac{3}{10}$ | $3\frac{3}{4}$ | $5\frac{1}{4}$ | $4\frac{1}{8}$ | $7\frac{3}{8}$ |
| $\frac{7}{10}$ | $4\frac{9}{10}$ | $5\frac{5}{6}$ | $9\frac{1}{6}$ | $2\frac{1}{10}$ | $1\frac{11}{12}$ | $8\frac{1}{6}$ |
| 5. $\frac{7}{12}$ | $5\frac{7}{8}$ | $2\frac{1}{10}$ | $8\frac{5}{6}$ | $3\frac{7}{10}$ | $3\frac{1}{10}$ | $8\frac{5}{8}$ |
| $\frac{7}{8}$ | $7\frac{3}{10}$ | $3\frac{5}{6}$ | $4\frac{7}{8}$ | $3\frac{3}{4}$ | $1\frac{3}{8}$ | $9\frac{5}{6}$ |



1. To add $\frac{1}{8}$, $\frac{1}{3}$, and $\frac{1}{6}$ you need to find the least common denominator, which is the smallest number that will contain 8, 3, and 6 exactly. Here is an easy way to do it.

First try the largest denominator, which is 8, and see whether it contains both 3 and 6. You find that 8 *does not* contain either of these numbers. Next multiply 8 by 2, which gives 16, and see if 16 contains both 6 and 3; 16 *does not* contain them. Then multiply 8 by 3, which gives 24. You find that 24 *does* contain both 6 and 3, so 24 is the least common denominator. Then change $\frac{1}{8}$, $\frac{1}{3}$, and $\frac{1}{6}$ each to 24ths, as shown at the right, and add the numerators. The sum is $\frac{15}{24}$ which can be reduced to $\frac{5}{8}$.

$$\begin{array}{rcl} \frac{1}{8} & = & \frac{3}{24} \\ \frac{1}{3} & = & \frac{8}{24} \\ \frac{1}{6} & = & \frac{4}{24} \\ \hline & & \frac{15}{24} = \frac{5}{8} \end{array}$$

*To find the least common denominator, see if the largest denominator contains the other denominators. If not, multiply it in turn by 2, 3, 4, and so on, until you get a number that exactly contains each denominator.*

Add. Find the least common denominator as shown above:

| | | | | | | |
|---|---|---|---|---|---|---|
| 2. $\frac{5}{6}$ | $4\frac{1}{3}$ | $3\frac{1}{2}$ | $1\frac{3}{8}$ | $6\frac{2}{3}$ | $4\frac{3}{4}$ | $5\frac{2}{3}$ |
| $\frac{1}{2}$ | $2\frac{3}{4}$ | $2\frac{2}{3}$ | $5\frac{2}{3}$ | $2\frac{1}{4}$ | $9\frac{4}{5}$ | $8\frac{1}{6}$ |
| $\frac{1}{8}$ | $1\frac{1}{6}$ | $2\frac{3}{5}$ | $3\frac{5}{6}$ | $5\frac{5}{8}$ | $2\frac{9}{10}$ | $7\frac{7}{8}$ |
| 3. $\frac{2}{3}$ | $2\frac{1}{2}$ | $1\frac{5}{8}$ | $4\frac{2}{3}$ | $3\frac{7}{8}$ | $7\frac{1}{2}$ | $5\frac{1}{8}$ |
| $\frac{1}{8}$ | $1\frac{1}{3}$ | $3\frac{1}{6}$ | $1\frac{3}{8}$ | $2\frac{1}{2}$ | $1\frac{1}{3}$ | $2\frac{3}{4}$ |
| $\frac{3}{4}$ | $1\frac{3}{4}$ | $2\frac{1}{12}$ | $2\frac{5}{6}$ | $6\frac{1}{3}$ | $3\frac{1}{6}$ | $6\frac{1}{3}$ |
| $\frac{1}{12}$ | $2\frac{5}{6}$ | $5\frac{1}{16}$ | $3\frac{1}{2}$ | $4\frac{3}{4}$ | $2\frac{1}{8}$ | $1\frac{1}{2}$ |
| 4. $\frac{1}{2}$ | $6\frac{1}{6}$ | $2\frac{3}{8}$ | $4\frac{2}{3}$ | $5\frac{1}{4}$ | $2\frac{7}{8}$ | $3\frac{1}{4}$ |
| $\frac{2}{3}$ | $3\frac{1}{2}$ | $5\frac{1}{4}$ | $1\frac{1}{2}$ | $9\frac{3}{10}$ | $8\frac{1}{6}$ | $1\frac{1}{6}$ |
| $\frac{1}{8}$ | $1\frac{3}{4}$ | $4\frac{1}{3}$ | $1\frac{1}{4}$ | $1\frac{2}{5}$ | $6\frac{2}{3}$ | $7\frac{1}{4}$ |
| $\frac{3}{4}$ | $4\frac{2}{3}$ | $3\frac{7}{12}$ | $6\frac{5}{6}$ | $7\frac{1}{2}$ | $4\frac{1}{4}$ | $5\frac{1}{2}$ |

Add. Check the work by going over it:

| | | | | | | |
|---|---|---|---|---|---|---|
| 1. $\frac{2}{3}$ | $1\frac{1}{3}$ | $3\frac{9}{10}$ | $1\frac{1}{2}$ | $2\frac{5}{12}$ | $3\frac{1}{2}$ | $2\frac{3}{4}$ |
| $\frac{1}{4}$ | $2\frac{1}{6}$ | $4\frac{4}{5}$ | $1\frac{2}{3}$ | $5\frac{2}{3}$ | $1\frac{1}{4}$ | $2\frac{1}{2}$ |
| $\frac{1}{8}$ | $1\frac{1}{8}$ | $2\frac{1}{2}$ | $1\frac{3}{8}$ | $2\frac{3}{4}$ | $4\frac{1}{3}$ | $1\frac{3}{8}$ |
| 2. $\frac{1}{6}$ | $4\frac{7}{12}$ | $1\frac{1}{2}$ | $3\frac{3}{4}$ | $5\frac{5}{16}$ | $2\frac{1}{6}$ | $1\frac{1}{3}$ |
| $\frac{1}{8}$ | $2\frac{1}{2}$ | $6\frac{2}{5}$ | $1\frac{1}{2}$ | $2\frac{1}{4}$ | $4\frac{7}{8}$ | $3\frac{3}{4}$ |
| $\frac{1}{12}$ | $5\frac{5}{6}$ | $8\frac{1}{6}$ | $3\frac{2}{3}$ | $2\frac{3}{8}$ | $9\frac{1}{12}$ | $1\frac{5}{6}$ |
| 3. $\frac{5}{8}$ | $7\frac{1}{2}$ | $2\frac{5}{8}$ | $4\frac{2}{3}$ | $2\frac{1}{6}$ | $1\frac{3}{8}$ | $3\frac{4}{5}$ |
| $\frac{1}{3}$ | $1\frac{2}{3}$ | $8\frac{1}{4}$ | $5\frac{3}{8}$ | $2\frac{11}{12}$ | $5\frac{5}{6}$ | $1\frac{7}{10}$ |
| $\frac{1}{2}$ | $2\frac{3}{4}$ | $3\frac{1}{2}$ | $2\frac{1}{6}$ | $2\frac{1}{3}$ | $1\frac{5}{12}$ | $2\frac{1}{2}$ |
| $\frac{1}{6}$ | $2\frac{7}{8}$ | $1\frac{3}{16}$ | $1\frac{1}{12}$ | $2\frac{1}{4}$ | $4\frac{1}{4}$ | $3\frac{3}{5}$ |
| 4. $\frac{1}{5}$ | $3\frac{1}{3}$ | $2\frac{1}{2}$ | $1\frac{15}{16}$ | $2\frac{1}{3}$ | $3\frac{5}{6}$ | $4\frac{2}{3}$ |
| $\frac{3}{4}$ | $4\frac{1}{6}$ | $3\frac{2}{3}$ | $5\frac{3}{8}$ | $6\frac{3}{4}$ | $3\frac{2}{3}$ | $1\frac{4}{5}$ |
| $\frac{1}{2}$ | $1\frac{7}{12}$ | $2\frac{1}{4}$ | $4\frac{3}{4}$ | $1\frac{3}{8}$ | $5\frac{1}{12}$ | $5\frac{3}{10}$ |
| $\frac{7}{10}$ | $2\frac{1}{2}$ | $2\frac{5}{8}$ | $5\frac{1}{2}$ | $2\frac{1}{12}$ | $4\frac{1}{2}$ | $2\frac{1}{2}$ |

Subtract. Check the work by going over it:

| | | | | | | |
|---|---|---|---|---|---|---|
| 5. $\frac{5}{6}$ | $4\frac{7}{10}$ | $8\frac{5}{6}$ | $9\frac{5}{8}$ | $6\frac{1}{4}$ | $7\frac{3}{8}$ | $4\frac{1}{4}$ |
| $\frac{3}{4}$ | $1\frac{1}{4}$ | $3\frac{9}{10}$ | $4\frac{1}{12}$ | $2\frac{5}{6}$ | $3\frac{7}{10}$ | $2\frac{3}{10}$ |
| 6. $\frac{7}{8}$ | $5\frac{3}{8}$ | $9\frac{5}{8}$ | $6\frac{7}{12}$ | $4\frac{3}{10}$ | $8\frac{1}{4}$ | $5\frac{1}{3}$ |
| $\frac{3}{4}$ | $2\frac{7}{8}$ | $1\frac{1}{3}$ | $3\frac{1}{2}$ | $3\frac{4}{5}$ | $5\frac{5}{16}$ | $1\frac{5}{6}$ |
| 7. $\frac{9}{16}$ | $2\frac{1}{8}$ | $3\frac{3}{4}$ | $5\frac{3}{8}$ | $9\frac{1}{2}$ | $7\frac{1}{6}$ | $6\frac{2}{3}$ |
| $\frac{3}{8}$ | $1\frac{5}{12}$ | $2\frac{5}{16}$ | $3\frac{3}{10}$ | $6\frac{11}{12}$ | $2\frac{5}{6}$ | $1\frac{1}{2}$ |
| 8. $\frac{3}{4}$ | $6\frac{7}{10}$ | $3\frac{1}{2}$ | $9\frac{5}{6}$ | $5\frac{1}{4}$ | $4\frac{5}{8}$ | $9\frac{7}{8}$ |
| $\frac{1}{6}$ | $4\frac{1}{2}$ | $2\frac{4}{5}$ | $3\frac{3}{10}$ | $2\frac{3}{8}$ | $2\frac{1}{12}$ | $2\frac{1}{4}$ |



1. The boys are making new sails for their boats. Tom needs $\frac{3}{4}$ yd. of canvas, Ed needs $\frac{1}{2}$ yd., and Dick needs $1\frac{1}{8}$ yd. If they buy the canvas in one piece, how long must it be?

2. John's father weighs $151\frac{1}{2}$ lb. John weighs $79\frac{3}{4}$ lb. What is the difference in their weights?

3. Alice bought two pieces of the same material at a sale. There were $2\frac{1}{8}$ yd. in one piece and $1\frac{3}{4}$ yd. in the other piece. How much material did Alice have in the two pieces?

4. Bill was practicing the 50-yard dash. When he began practicing it took him $9\frac{2}{5}$ sec. to run 50 yd. After practicing several days he could do it in $8\frac{1}{2}$ sec. By how many seconds did he shorten his time through practice?

Add. Check the work by going over it:

| | | | | | | |
|---|---|---|---|---|---|---|
| 5. $3\frac{1}{9}$ | $1\frac{1}{3}$ | $4\frac{3}{5}$ | $3\frac{5}{6}$ | $4\frac{1}{2}$ | $2\frac{3}{4}$ | $2\frac{2}{3}$ |
| $4\frac{3}{8}$ | $2\frac{3}{4}$ | $6\frac{1}{2}$ | $2\frac{1}{8}$ | $3\frac{2}{3}$ | $1\frac{3}{5}$ | $1\frac{1}{4}$ |
| $5\frac{7}{12}$ | $1\frac{7}{8}$ | $2\frac{3}{10}$ | $4\frac{5}{12}$ | $7\frac{5}{6}$ | $3\frac{7}{10}$ | $3\frac{1}{6}$ |
| 6. $5\frac{3}{8}$ | $4\frac{1}{4}$ | $2\frac{1}{3}$ | $5\frac{1}{2}$ | $1\frac{3}{4}$ | $7\frac{1}{4}$ | $4\frac{5}{8}$ |
| $3\frac{3}{8}$ | $2\frac{5}{8}$ | $1\frac{1}{4}$ | $4\frac{2}{3}$ | $2\frac{1}{5}$ | $6\frac{1}{3}$ | $2\frac{1}{2}$ |
| $2\frac{3}{4}$ | $3\frac{3}{16}$ | $4\frac{1}{2}$ | $1\frac{5}{6}$ | $3\frac{1}{10}$ | $4\frac{1}{12}$ | $1\frac{1}{3}$ |
| $1\frac{5}{12}$ | $5\frac{1}{2}$ | $3\frac{5}{6}$ | $3\frac{7}{8}$ | $1\frac{1}{2}$ | $3\frac{1}{6}$ | $3\frac{3}{4}$ |

Subtract. Check the work by going over it:

| | | | | | | |
|---|---|---|---|---|---|---|
| 7. $5\frac{1}{6}$ | $3\frac{3}{5}$ | $4\frac{1}{4}$ | $5\frac{1}{8}$ | $3\frac{1}{2}$ | $4\frac{1}{12}$ | $2\frac{1}{6}$ |
| $3\frac{1}{4}$ | $2\frac{9}{10}$ | $1\frac{1}{3}$ | $4\frac{5}{6}$ | $2\frac{7}{16}$ | $3\frac{3}{8}$ | $1\frac{3}{10}$ |
| 8. $4\frac{1}{8}$ | $7\frac{2}{3}$ | $4\frac{11}{12}$ | $2\frac{3}{10}$ | $6\frac{1}{2}$ | $3\frac{1}{4}$ | $4\frac{5}{6}$ |
| $2\frac{1}{10}$ | $3\frac{5}{8}$ | $2\frac{5}{6}$ | $1\frac{3}{4}$ | $3\frac{4}{5}$ | $1\frac{5}{6}$ | $2\frac{3}{8}$ |
| 9. $4\frac{1}{2}$ | $6\frac{3}{4}$ | $8\frac{5}{16}$ | $3\frac{5}{12}$ | $9\frac{3}{4}$ | $7\frac{3}{5}$ | $5\frac{3}{8}$ |
| $1\frac{3}{8}$ | $2\frac{7}{8}$ | $4\frac{9}{16}$ | $2\frac{1}{6}$ | $5\frac{5}{6}$ | $4\frac{1}{2}$ | $1\frac{5}{6}$ |

Some of the numbers in these problems are not needed to find the answer. In each problem tell which numbers are not needed and then solve the problem:

1. The 15 girls in our cooking class made 222 cookies. How many dozen cookies did they make?

In finding the answer you do not use the fact that 15 girls made the cookies.

2. Jane had $2.00 in her pocketbook. She bought 3 drawing pencils at 10¢ each and 5 sheets of drawing paper at 8¢ each. How much did she spend in all?

3. A 10-car passenger train traveled 630 mi. in 15 hr. What was its average speed in miles per hour?

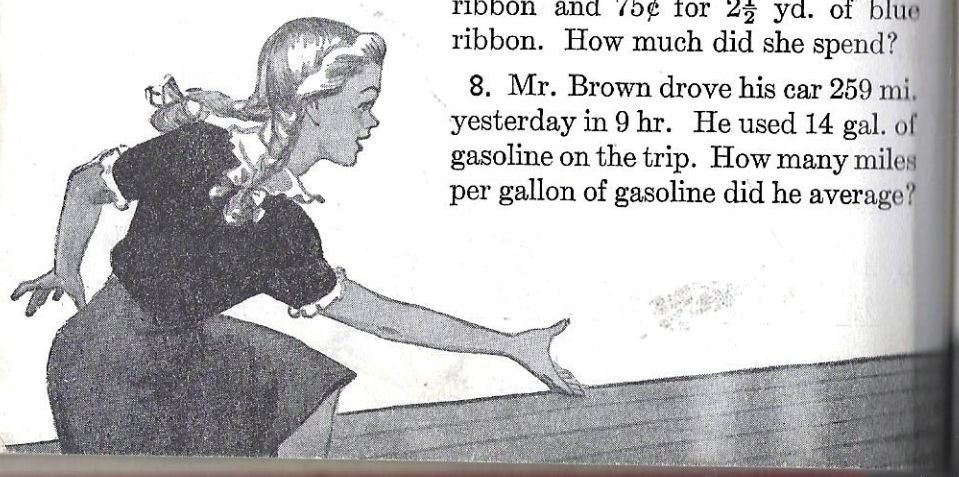
4. Bill earned $31.50 in 6 wk. last summer. He bought a suit for $18.50 and a pair of shoes for $3.75. How much money did he have left?

5. Ed's allowance is 50¢ a week. He spends 20¢ a week for movies. How much does he spend for movies in 4 wk.?

6. In Newtown it costs $1.45 a month to have the daily and Sunday paper delivered to your home. At the newsstand the daily paper costs 3¢ each and the Sunday paper, 10¢. How much is your paper bill for a month if you buy 27 daily papers and 4 Sunday papers at the newsstand?

7. Kate paid 53¢ for $3\frac{1}{2}$ yd. of red ribbon and 75¢ for $2\frac{1}{2}$ yd. of blue ribbon. How much did she spend?

8. Mr. Brown drove his car 259 mi. yesterday in 9 hr. He used 14 gal. of gasoline on the trip. How many miles per gallon of gasoline did he average?





1. Pencils can be bought for 5¢ each, or a box of 12 pencils can be bought for 45¢. If Ann needs 12 pencils, how much money can she save by buying a box of pencils?

2. Jack spends 25¢ for lunch and 12¢ for bus fare each school day. How much does he spend in 23 school days?

3. Bill cut $2\frac{1}{2}$ ft. of wire off a piece of wire 10 ft. long. How many feet of wire did he have left?

4. Find the cost of 2125 small flags at $.14 each.

5. Mr. West bought a case of 30 doz. eggs for $12.60 and sold them all at $.25 a half dozen. How much more did he get for the eggs than he paid for them?

6. Jim's father gave him $5.00 to pay for 3 bus tickets at $1.55 each. He told Jim to buy 3-cent stamps with the rest of the money. How many stamps did Jim buy? Did he have any money left?

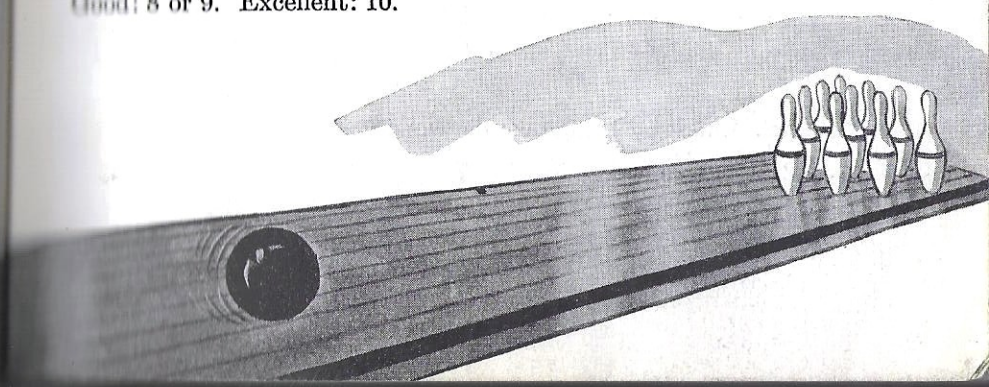
7. On a trip in his car Mr. Wells rode $1\frac{1}{2}$ hr., stopped $\frac{1}{4}$ hr. at a store, spent $\frac{1}{2}$ hr. at lunch, and rode $\frac{3}{4}$ hr. more. How many hours did the trip take?

8. Elizabeth saved $\frac{1}{2}$ of all the money she earned working 36 hr. at $.25 an hour. How much did she save?

9. Find the cost of 3 doz. marbles at 3¢ a marble.

10. Bill Reed climbed to the top of a mountain 6500 ft. high. How many feet higher than 1 mi. is the mountain? 5280 ft. = 1 mi.

Poor: 0 to 5 right. Fair: 6 or 7.
Good: 8 or 9. Excellent: 10.



1. Betty's cash account for October shows that she received a total of \$1.95 during the month and spent a total of \$1.48. What is her balance at the end of the month?

2. Fred bought 2 books at \$.45 each and a game for \$.50. How much did he have left from \$2.00?

3. Mary bought $\frac{1}{2}$ lb. of salted nuts at \$.60 a pound and a jar of candy for \$.39. How much did she spend?

4. Tell which fractions are proper and which are improper:
$\frac{16}{3}$ $\frac{5}{8}$ $\frac{20}{4}$ $\frac{15}{16}$ $\frac{23}{24}$ $\frac{50}{48}$ $\frac{30}{6}$ $\frac{25}{35}$

5. In a proper fraction is the numerator larger or smaller than the denominator?

6. Reduce to lowest terms: $\frac{10}{25}$ $\frac{14}{16}$ $\frac{24}{48}$ $\frac{35}{50}$ $\frac{24}{32}$

7. Change to sixteenths: $\frac{3}{4}$ $\frac{5}{8}$ $\frac{1}{2}$ $\frac{7}{8}$

8. Change to mixed numbers: $\frac{18}{4}$ $\frac{25}{3}$ $\frac{16}{6}$ $\frac{35}{4}$

Tell what numbers should be put in place of the stars:

9. $7 = 6\frac{*}{2}$ $\quad 6\frac{5}{6} = 5\frac{*}{6}$ $\quad 5\frac{1}{2} = 5\frac{*}{4} = 4\frac{*}{4}$

10. $10 = 9\frac{*}{6}$ $\quad 8\frac{7}{12} = 7\frac{*}{12}$ $\quad 12\frac{2}{3} = 12\frac{*}{12} = 11\frac{*}{12}$

11. $12 = 11\frac{*}{8}$ $\quad 7\frac{3}{10} = 6\frac{*}{10}$ $\quad 14\frac{3}{8} = 14\frac{*}{16} = 13\frac{*}{16}$

Find the least common denominator and the sum for these exercises:

12. $\frac{3}{4} + \frac{5}{6}$ $\quad \frac{5}{8} + \frac{1}{6}$ $\quad \frac{2}{3} + \frac{5}{8} + \frac{3}{4} + \frac{7}{12}$

Add. Check by going over the work:

13.

| | | | | | | |
|---|---|---|---|---|---|---|
| $4\frac{1}{3}$ | $3\frac{3}{8}$ | $2\frac{3}{4}$ | $3\frac{5}{6}$ | $4\frac{1}{2}$ | $4\frac{1}{5}$ | $1\frac{3}{8}$ |
| $2\frac{1}{6}$ | $2\frac{1}{2}$ | $1\frac{7}{8}$ | $2\frac{1}{4}$ | $3\frac{7}{10}$ | $3\frac{1}{2}$ | $2\frac{1}{10}$ |
| $3\frac{1}{12}$ | $1\frac{3}{16}$ | $3\frac{2}{3}$ | $2\frac{2}{3}$ | $2\frac{3}{5}$ | $1\frac{1}{6}$ | $1\frac{1}{5}$ |

Subtract. Check by going over the work:

14.

| | | | | | | |
|---|---|---|---|---|---|---|
| $2\frac{2}{5}$ | $4\frac{1}{8}$ | $5\frac{3}{4}$ | $7$ | $3\frac{1}{6}$ | $4\frac{7}{10}$ | $5\frac{3}{8}$ |
| $1\frac{7}{10}$ | $2\frac{11}{16}$ | $2\frac{5}{6}$ | $\frac{9}{10}$ | $2\frac{7}{12}$ | $3\frac{1}{6}$ | $4\frac{1}{6}$ |



If you miss more than one example in any row, turn to the Practice Pages for that row.

Reduce each fraction to lowest terms:

| | | | | | PRACTICE PAGES |
|---|---|---|---|---|---|
| 1. $\frac{18}{30}$ | $\frac{16}{18}$ | $\frac{36}{48}$ | $\frac{35}{40}$ | $\frac{25}{100}$ | 54 |

Change these fractions to mixed numbers:

| | | | | | |
|---|---|---|---|---|---|
| 2. $\frac{14}{8}$ | $\frac{27}{8}$ | $\frac{28}{12}$ | $\frac{25}{6}$ | $\frac{30}{16}$ | 55 |

What number does the star stand for?

| | | | | |
|---|---|---|---|---|
| 3. $4 = 3\frac{*}{4}$ | $8\frac{1}{8} = 7\frac{*}{8}$ | $6\frac{1}{6} = 6\frac{*}{12} = 5\frac{*}{12}$ | | 60 |
| 4. $5 = 4\frac{*}{6}$ | $2\frac{2}{3} = 1\frac{*}{3}$ | $9\frac{3}{8} = 9\frac{*}{16} = 8\frac{*}{16}$ | | 60 |

Add. Check by going over the work:

| | | | | | |
|---|---|---|---|---|---|
| 5. $2\frac{1}{6}$ | $7\frac{3}{4}$ | $4\frac{1}{2}$ | $3\frac{11}{12}$ | $1\frac{3}{8}$ | |
| $\frac{5}{8}$ | $2\frac{5}{8}$ | $3\frac{1}{10}$ | $2\frac{1}{4}$ | $\frac{3}{16}$ | 56 |
| 6. $4\frac{2}{3}$ | $1\frac{3}{10}$ | $5\frac{1}{2}$ | $5\frac{5}{6}$ | $2\frac{7}{10}$ | |
| $2\frac{1}{2}$ | $1\frac{1}{6}$ | $2\frac{3}{5}$ | $3\frac{3}{4}$ | $3\frac{1}{4}$ | 57, 68 |
| 7. $3\frac{1}{3}$ | $2\frac{5}{12}$ | $2\frac{5}{8}$ | $3\frac{1}{4}$ | $4\frac{3}{4}$ | |
| $2\frac{1}{4}$ | $3\frac{1}{4}$ | $3\frac{1}{2}$ | $1\frac{5}{6}$ | $2\frac{1}{2}$ | |
| $1\frac{1}{3}$ | $4\frac{1}{2}$ | $2\frac{1}{6}$ | $2\frac{1}{8}$ | $1\frac{3}{10}$ | 57, 68 |

Subtract. Check by going over the work:

| | | | | | |
|---|---|---|---|---|---|
| 8. $6\frac{7}{8}$ | $4\frac{1}{3}$ | $5\frac{7}{12}$ | $2\frac{11}{16}$ | $3\frac{1}{2}$ | |
| $2\frac{3}{8}$ | $4\frac{1}{4}$ | $4\frac{1}{3}$ | $\frac{5}{8}$ | $2\frac{2}{5}$ | 58 |
| 9. $5\frac{5}{10}$ | $4\frac{1}{6}$ | $3\frac{5}{12}$ | $6\frac{3}{8}$ | $2\frac{1}{4}$ | |
| $2\frac{3}{8}$ | $2\frac{3}{4}$ | $2\frac{2}{3}$ | $3\frac{5}{6}$ | $1\frac{9}{10}$ | 61, 68 |

Diagnostic test.

CHAPTER THREE

# Multiplying Fractions

## FOREST FIRES

1. In this country in 1936 the damage to timber and other property caused by forest fires amounted to $54,000,000, while in 1941 the damage was $36,000,000. The damage in 1936 was how many times as great as in 1941?

2. It costs about $25,000,000 a year to protect forests against fire; this cost is in addition to the damage done. What was the total cost of the damage and the protection in 1936? in 1941? See ex. 1.

3. It pays to protect forests. In 1941 the total damage was $36,000,000, but on protected areas the damage that year was $8,000,000. The rest of the damage was on unprotected areas. Find the amount of the damage on unprotected areas. The damage on unprotected areas was how many times as great as on protected areas?

4. About $\frac{1}{4}$ of all forest fires are caused by carelessness of smokers. What was the amount of the loss due to this cause in 1936? in 1941? See ex. 1.

5. Forest fires sometimes burn so fast that they overtake running deer. In Idaho in 1910 a great forest fire burned a strip of country 120 mi. long in 24 hr. How many miles of this strip were burned per hour?

6. In the Idaho fire 3125 sq. mi. of growing timber were destroyed. The land area of the entire state of Rhode Island is 1058 sq. mi. The Idaho fire destroyed a timber area about how many times the size of Rhode Island?

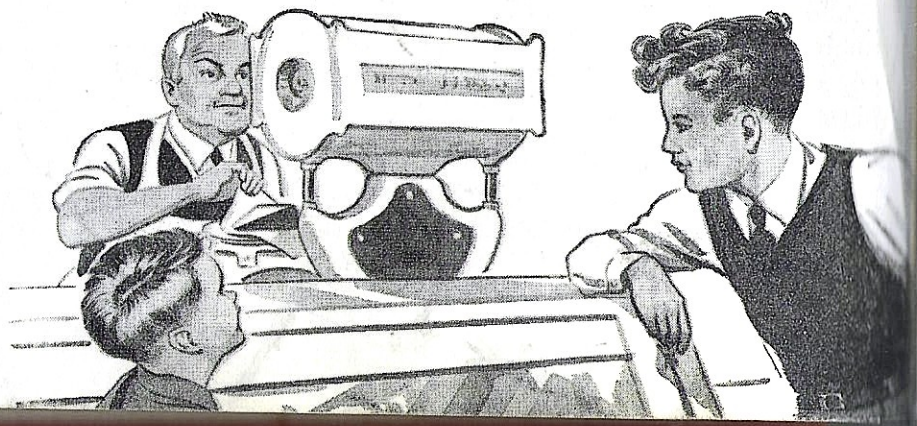
1. Jack asked the clerk for $\frac{1}{2}$ lb. of cheese at 32¢ a pound. When the clerk cut the cheese it weighed 10 oz. How much did that piece of cheese cost?

Jack thought "10 oz. is $\frac{10}{16}$ or $\frac{5}{8}$ lb., so I must find $\frac{5}{8}$ of 32¢. $\frac{1}{8}$ of 32 = 4, so $\frac{5}{8}$ of 32 = 5 × 4, or 20." The cheese cost 20¢.

2. Another way to write $\frac{5}{8}$ of 32 is $\frac{5}{8} \times 32$. The sign × means "of" when it is written after a fraction. When you find $\frac{5}{8} \times 32$, you are multiplying 32 by $\frac{5}{8}$. This is called finding a fractional part of 32. When the numbers are not large, you can do the work in your head.

Find the answers. Do the work in your head:

| | | | | |
|---|---|---|---|---|
| 3. $\frac{1}{3}$ of 3 | $\frac{2}{3}$ of 3 | $\frac{3}{4} \times 12$ | $\frac{1}{3} \times 9$ | $\frac{3}{8} \times 40$ |
| 4. $\frac{1}{4}$ of 8 | $\frac{3}{4}$ of 8 | $\frac{1}{4} \times 84$ | $\frac{2}{3} \times 6$ | $\frac{3}{4} \times 20$ |
| 5. $\frac{1}{6}$ of 6 | $\frac{5}{6}$ of 6 | $\frac{3}{5} \times 20$ | $\frac{1}{2} \times 4$ | $\frac{5}{6} \times 18$ |
| 6. $\frac{1}{8}$ of 24 | $\frac{3}{8}$ of 24 | $\frac{4}{5} \times 10$ | $\frac{1}{3} \times 27$ | $\frac{2}{3} \times 27$ |
| 7. $\frac{1}{5}$ of 15 | $\frac{2}{5}$ of 15 | $\frac{3}{16} \times 48$ | $\frac{1}{5} \times 35$ | $\frac{3}{4} \times 36$ |
| 8. $\frac{1}{2}$ of 12 | $\frac{1}{2}$ of 36 | $\frac{5}{12} \times 36$ | $\frac{5}{8} \times 56$ | $\frac{1}{4} \times 44$ |
| 9. $\frac{3}{4}$ of 16 | $\frac{1}{6}$ of 24 | $\frac{5}{6} \times 24$ | $\frac{11}{12} \times 24$ | $\frac{3}{10} \times 80$ |
| 10. $\frac{1}{6}$ of 30 | $\frac{5}{6}$ of 30 | $\frac{1}{8} \times 48$ | $\frac{7}{8} \times 48$ | $\frac{2}{3} \times 21$ |
| 11. $\frac{1}{3}$ of 33 | $\frac{2}{3}$ of 33 | $\frac{5}{8} \times 64$ | $\frac{9}{16} \times 32$ | $\frac{4}{5} \times 45$ |
| 12. $\frac{1}{2}$ of 20 | $\frac{1}{4}$ of 40 | $\frac{3}{4} \times 44$ | $\frac{7}{10} \times 50$ | $\frac{5}{6} \times 42$ |





1. On page 76 when Jack bought $\frac{5}{8}$ lb. of cheese he had to find $\frac{5}{8}$ of 32¢. To do this he *first divided* 32 by 8, which gave 4. Then he *multiplied* 4 by 5, which gave 20. He could have found the same answer by *first multiplying* 32 by 5, which gives 160, and then *dividing* 160 by 8, which gives 20. See the work at the right. In each case it is necessary to multiply by 5 and to divide by 8 but the order of doing it in the second case is the reverse of that in the first case.

$$\frac{5}{8} \times 32 = \frac{5 \times 32}{8} = \frac{160}{8} = 20$$

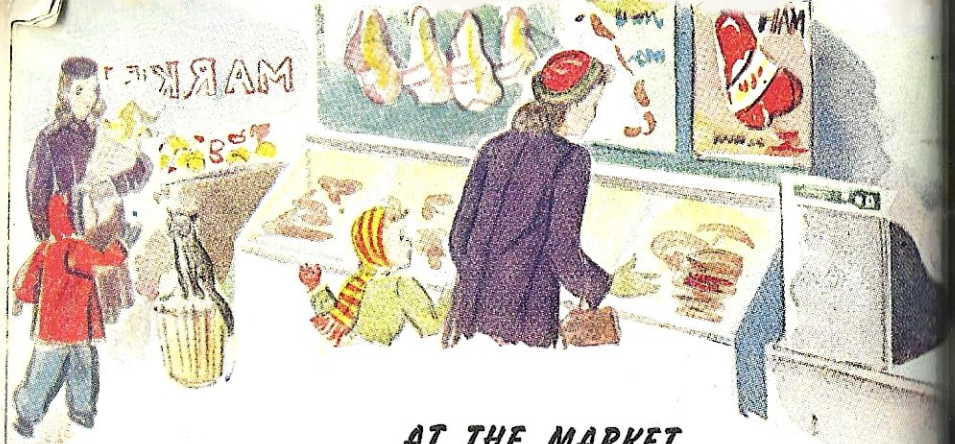
2. Suppose the cheese cost 35¢ a pound. Then Jack would have to find $\frac{5}{8}$ of 35¢. Since 8 does not divide 35 exactly, it is easier *first to multiply* 35 by 5, which gives 175, and then *to divide* 175 by 8, which gives $21\frac{7}{8}$. See the work below. The cheese costs $21\frac{7}{8}$¢, which is called 22¢ at the store.

$$\frac{5}{8} \times 35 = \frac{5 \times 35}{8} = \frac{175}{8} = 21\frac{7}{8}$$

3. Mary needs 12 in. of red wool cloth to make a scarf. If she pays 95¢ a yard for the cloth, how much will a piece 12 in. long cost? If she pays 89¢ a yard for the cloth, how much will 12 in. cost?

Find the answers:

| | | | | |
|---|---|---|---|---|
| 4. $\frac{3}{8} \times 4$ | $\frac{5}{6} \times 12$ | $\frac{1}{4} \times 17$ | $\frac{3}{10} \times 19$ | $\frac{3}{4} \times 15$ |
| 5. $\frac{3}{4} \times 7$ | $\frac{5}{8} \times 21$ | $\frac{3}{5} \times 15$ | $\frac{1}{2} \times 17$ | $\frac{7}{8} \times 24$ |
| 6. $\frac{3}{5} \times 4$ | $\frac{3}{4} \times 19$ | $\frac{1}{5} \times 29$ | $\frac{7}{10} \times 21$ | $\frac{2}{3} \times 25$ |
| 7. $\frac{7}{8} \times 3$ | $\frac{3}{16} \times 11$ | $\frac{1}{6} \times 25$ | $\frac{4}{5} \times 18$ | $\frac{7}{8} \times 15$ |
| 8. $\frac{3}{8} \times 9$ | $\frac{7}{16} \times 13$ | $\frac{1}{3} \times 43$ | $\frac{7}{16} \times 11$ | $\frac{3}{4} \times 36$ |
| 9. $\frac{3}{8} \times 5$ | $\frac{5}{16} \times 11$ | $\frac{5}{8} \times 48$ | $\frac{1}{8} \times 27$ | $\frac{5}{6} \times 41$ |
| 10. $\frac{3}{8} \times 5$ | $\frac{3}{10} \times 13$ | $\frac{2}{3} \times 33$ | $\frac{11}{12} \times 11$ | $\frac{2}{3} \times 17$ |
| 11. $\frac{1}{3} \times 9$ | $\frac{5}{12} \times 11$ | $\frac{4}{5} \times 12$ | $\frac{3}{16} \times 15$ | $\frac{3}{8} \times 15$ |
| 12. $\frac{3}{8} \times 6$ | $\frac{9}{16} \times 10$ | $\frac{1}{2} \times 15$ | $\frac{9}{10} \times 11$ | $\frac{1}{3} \times 19$ |



## AT THE MARKET

1. Ann and Betty invited the members of the Skating Club to dinner last Saturday. The girls did the shopping at the market. They brought home a sales slip like the one shown at the left. On the slip "$2\frac{1}{2}$ doz. rolls @ 25" means that the rolls cost 25¢ a dozen. "$4\frac{1}{4}$ lb. meat @ 45" means that the meat cost 45¢ a pound. The sign @ means "at." The sales slip shows that $2\frac{1}{2}$ doz. rolls at 25¢ cost 63¢. To get 63¢, the work is done as follows:

| CENTRAL MARKET<br>121 Main St. Buffalo | | |
|---|---|---|
| 2 1/2 doz. rolls @ 25 | | 63 |
| 4 1/4 lb meat @ 45 | 1 | 92 |
| 3/4 lb. butter @ 52 | | 39 |
| 1/2 doz. eggs @ 48 | | 24 |
| | 3 | 18 |
| | | |
| | | |
| | | |
| | | |

First multiply \$.25 by $\frac{1}{2}$ to find the cost of $\frac{1}{2}$ doz. rolls. Then multiply \$.25 by 2 to find the cost of 2 doz. rolls. Add the products. The sum is \$.62$\frac{1}{2}$, but the $\frac{1}{2}$¢ is called another cent. The rolls cost \$.63.

$$\begin{array}{r} \$.25 \\ 2\frac{1}{2} \\ \hline 12\frac{1}{2} \\ 50 \\ \hline \$.62\frac{1}{2} \end{array}$$

2. The sales slip shows that $4\frac{1}{4}$ lb. meat at \$.45 a pound cost \$1.92. Show how \$1.92 was obtained.

In this case $\frac{1}{4}$ lb. of meat cost $11\frac{1}{4}$¢, but the clerk in the store called $\frac{1}{4}$¢ another cent, which is what most stores do. In retail stores *any fraction* of a cent is usually counted as another cent.

To multiply a whole number by a mixed number, multiply first by the fraction, and then by the whole number, and add the products.

Multiply. Count any fraction of a cent as another cent:

| | | | |
|---|---|---|---|
| 3. $2\frac{1}{5} \times 17$ | $1\frac{1}{4} \times \$.50$ | $1\frac{3}{4} \times \$1.62$ | $3\frac{1}{4} \times \$1.44$ |
| 4. $6\frac{3}{8} \times 33$ | $4\frac{7}{8} \times \$.65$ | $2\frac{1}{8} \times \$1.00$ | $4\frac{3}{8} \times \$1.50$ |
| 5. $4\frac{1}{5} \times 30$ | $9\frac{3}{4} \times \$.19$ | $3\frac{1}{2} \times \$1.35$ | $2\frac{3}{4} \times \$1.25$ |
| 6. $7\frac{3}{4} \times 11$ | $2\frac{1}{2} \times \$.47$ | $4\frac{5}{8} \times \$2.25$ | $5\frac{1}{2} \times \$2.30$ |
| 7. $5\frac{2}{5} \times 19$ | $6\frac{1}{8} \times \$.75$ | $1\frac{7}{8} \times \$1.35$ | $8\frac{3}{4} \times \$1.69$ |

Multiplying whole numbers by mixed numbers.

1. Betty practices on her piano $\frac{3}{4}$ hr. after school each day. How many hours does she practice on 5 school days?

$\frac{3}{4}$ means 3 *fourths*. You multiply 3 *fourths* by 5 the same way that you multiply 3 *apples* by 5. You know that $5 \times 3$ *apples* = 15 *apples*. In the same way, $5 \times 3$ *fourths* = 15 *fourths*, or $\frac{15}{4}$.

$$5 \times \frac{3}{4} = \frac{5 \times 3}{4} = \frac{15}{4} = 3\tfrac{3}{4}$$

Multiply in your head:

| | | | | |
|---|---|---|---|---|
| 2. $4 \times \frac{1}{3}$ | $6 \times \frac{1}{5}$ | $2 \times \frac{2}{5}$ | $5 \times \frac{1}{12}$ | $9 \times \frac{1}{10}$ |
| 3. $8 \times \frac{2}{3}$ | $7 \times \frac{3}{4}$ | $5 \times \frac{1}{4}$ | $3 \times \frac{7}{10}$ | $7 \times \frac{7}{12}$ |
| 4. $3 \times \frac{5}{8}$ | $3 \times \frac{7}{8}$ | $9 \times \frac{1}{2}$ | $3 \times \frac{11}{16}$ | $3 \times \frac{5}{16}$ |

> To multiply a fraction by a whole number, multiply the numerator by the whole number and divide the result by the denominator.

5. Our class will serve tea and cookies to the Parents Association. Mary says we will need 7 doz. cookies. A box contains $1\frac{1}{2}$ doz. cookies. Will 5 boxes of cookies be enough?

First multiply $\frac{1}{2}$ by 5, which gives $2\frac{1}{2}$. Next multiply 1 by 5, which gives 5. Then add $2\frac{1}{2}$ and 5, which equals $7\frac{1}{2}$; 5 boxes contain $7\frac{1}{2}$ doz. cookies. This is $\frac{1}{2}$ doz. more than we need so 5 boxes are enough.

$$\begin{array}{r} 1\frac{1}{2} \\ 5 \\ \hline 2\frac{1}{2} \\ 5 \\ \hline 7\frac{1}{2} \end{array}$$

Multiply. Do the work on paper:

| | | | |
|---|---|---|---|
| 6. $9 \times 4\frac{1}{2}$ | $3 \times 4\frac{5}{8}$ | $15 \times 12\frac{1}{2}$ | $11 \times 18\frac{3}{4}$ |
| 7. $7 \times 3\frac{2}{3}$ | $7 \times 6\frac{1}{2}$ | $12 \times 14\frac{2}{5}$ | $25 \times 33\frac{1}{3}$ |
| 8. $5 \times 7\frac{3}{4}$ | $9 \times 5\frac{1}{4}$ | $17 \times 16\frac{2}{3}$ | $19 \times 11\frac{1}{4}$ |

Multiplying fractions and mixed numbers by whole numbers.



Division Test 1a. Time: $3\frac{1}{2}$ min. after copying.

| | | | |
|---|---|---|---|
| 1. $6\overline{)4914}$ | $9\overline{)5479}$ | | $7\overline{)1953}$ |
| 2. $8\overline{)7763}$ | $9\overline{)4257}$ | ⑥ | $7\overline{)4450}$ |

Division Test 1b. Time: $3\frac{1}{2}$ min. after copying.

| | | | |
|---|---|---|---|
| 3. $8\overline{)4304}$ | $7\overline{)2926}$ | | $9\overline{)2662}$ |
| 4. $6\overline{)1536}$ | $6\overline{)2443}$ | ⑥ | $8\overline{)3701}$ |

Division Test 1c. Time: $3\frac{1}{2}$ min. after copying.

| | | | |
|---|---|---|---|
| 5. $9\overline{)7841}$ | $6\overline{)5778}$ | | $9\overline{)5076}$ |
| 6. $7\overline{)4263}$ | $8\overline{)5721}$ | ⑥ | $7\overline{)3786}$ |

Improvement Tests.

## MEASURES

Tell what number should be put in each space:

| | | |
|---|---|---|
| 7. 1 yd. = .. ft. | 3 in. = .. ft. | $\frac{1}{2}$ yd. = .. in. |
| 8. 1 mi. = .. ft. | $\frac{1}{2}$ mi. = .. ft. | 18 in. = .. yd. |
| 9. 3 qt. = .. pt. | 4 qt. = .. pk. | $\frac{1}{4}$ lb. = .. oz. |
| 10. 2 yr. = .. mo. | 4 pt. = .. gal. | $\frac{3}{4}$ hr. = .. min. |
| 11. 1 bu. = .. pk. | $\frac{1}{4}$ yr. = .. mo. | 20 min. = .. hr. |
| 12. 6 ft. = .. in. | $\frac{1}{2}$ bu. = .. pk. | $\frac{1}{5}$ min. = .. sec. |
| 13. $\frac{2}{3}$ yd. = .. ft. | 9 mo. = .. yr. | $\frac{3}{4}$ gal. = .. qt. |
| 14. 4 wk. = .. da. | 8 oz. = .. lb. | 15 sec. = .. min. |
| 15. 3 hr. = .. min. | 4 wk. = .. yr. | $\frac{1}{2}$ T. = .. lb. |

To the Teacher: In ex. 1–6, pupils should write R before remainders.

# MEASURES OF LENGTH

1. Here is the table of measures of length:

| | | |
|---|---|---|
| 12 inches (in.) | = | 1 foot (ft.) |
| 3 feet (ft.) | = | 1 yard (yd.) |
| $16\frac{1}{2}$ feet or $5\frac{1}{2}$ yards | = | 1 rod (rd.) |
| 5280 feet or 320 rods | = | 1 mile (mi.) |

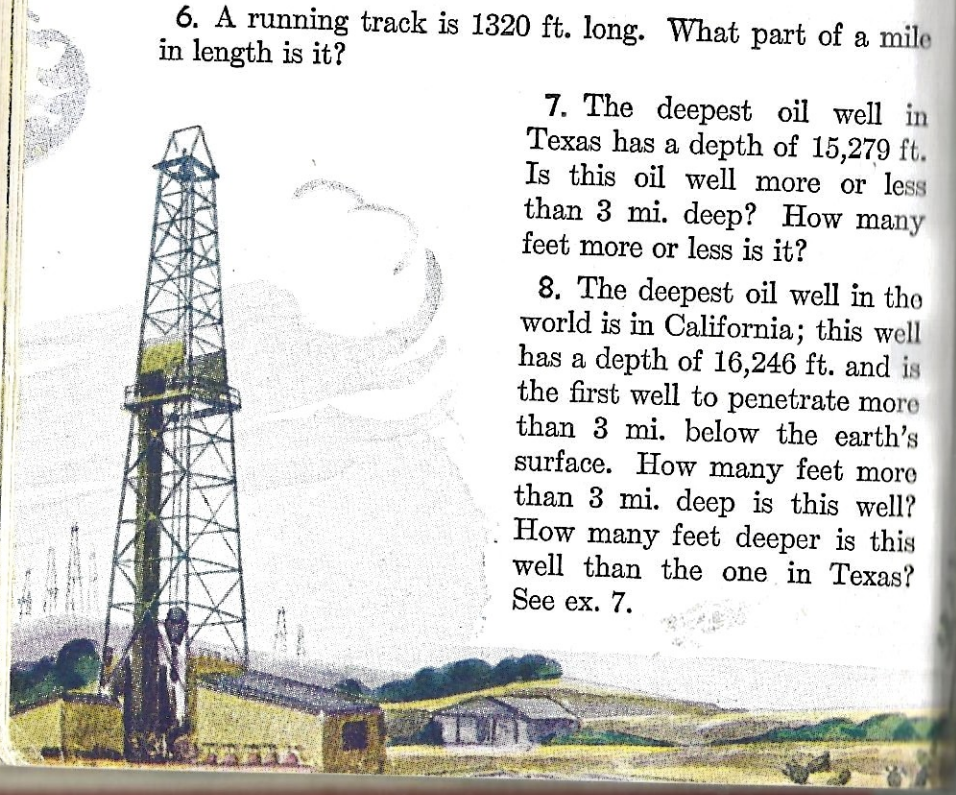
2. You see that the rod is one of the measures of length; it is sometimes used to measure fields or other farm land. A rod is $16\frac{1}{2}$ ft. long. Measure off $16\frac{1}{2}$ ft. on the floor to get an idea of the length of the rod. In the table you see that 320 rd. equal 1 mi.

3. How many feet are there in 2 rd.? in 8 rd.? in 5 rd.?

4. How many yards are there in 4 rd.? in 6 rd.? in 7 rd.?

5. Farmers buy wire fence by the rod. Find the cost of 30 rd. of wire fence at 24¢ a rod.

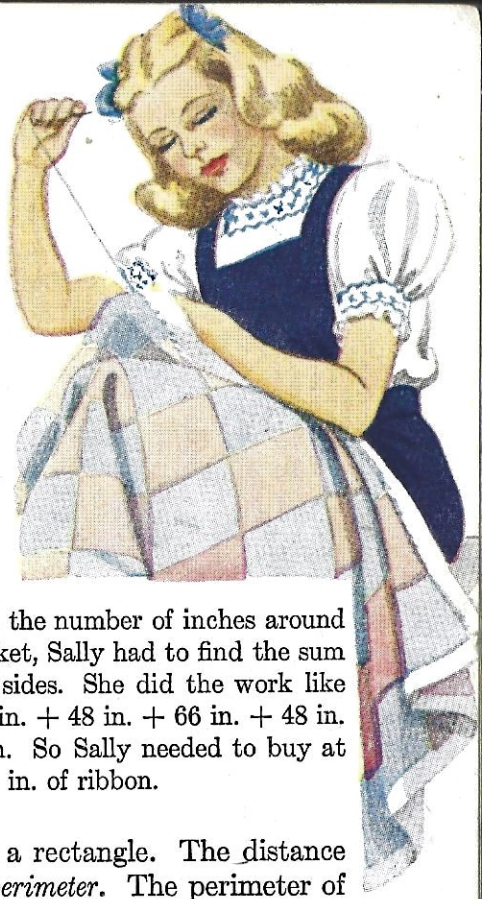
6. A running track is 1320 ft. long. What part of a mile in length is it?



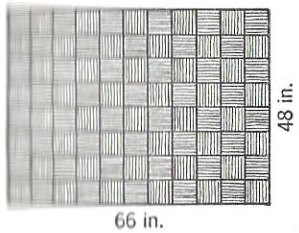
7. The deepest oil well in Texas has a depth of 15,279 ft. Is this oil well more or less than 3 mi. deep? How many feet more or less is it?

8. The deepest oil well in the world is in California; this well has a depth of 16,246 ft. and is the first well to penetrate more than 3 mi. below the earth's surface. How many feet more than 3 mi. deep is this well? How many feet deeper is this well than the one in Texas? See ex. 7.

# HOW MUCH RIBBON DID SHE NEED?



1. Sally knit a large number of wool squares which she sewed together to make a blanket shaped like a rectangle. The blanket is 48 in. wide and 66 in. long. She needed ribbon to sew around the edge of the blanket to bind it. How many inches is it around the blanket?




To find the number of inches around the blanket, Sally had to find the sum of the 4 sides. She did the work like this: 66 in. + 48 in. + 66 in. + 48 in. = 228 in. So Sally needed to buy at least 228 in. of ribbon.

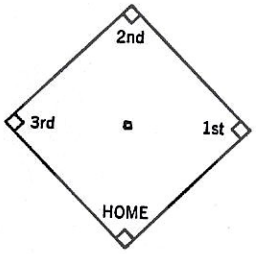
Sally's blanket has the shape of a rectangle. The distance around a rectangle is called its *perimeter*. The perimeter of the blanket is 228 in.

2. Sally's mother told her to buy 6 in. of ribbon more than the perimeter of the blanket so that she could make neat corners and join the ends nicely. How many yards of ribbon did Sally buy?

3. Sally's mother said that Sally could find the perimeter of the blanket another way, like this: $2 \times 48$ in. = 96 in.; $2 \times 66$ in. = 132 in.; 96 in. + 132 in. = 228 in. Which way do you like better, this way or the way used in ex. 1? Give a reason for your answer.

4. What is the perimeter of a rectangle 4 ft. long and $2\frac{1}{2}$ ft. wide? of a rectangle 42 ft. long and 31 ft. wide?

Finding perimeters.




1. A baseball diamond is a square 90 ft. on each side. How many feet does a player run to make a home run? How many yards is this?

2. In the city where Fred lives, each block is a rectangle 200 ft. wide and 240 ft. long. How many feet does Fred run if he runs around the block once? if he runs around 6 times? Does 6 times around make a mile?

3. In a rectangle like the one in ex. 2, 200 ft. and 240 ft. are called the *dimensions* of the rectangle. What are the dimensions of the rectangle in ex. 4? in ex. 5?

4. Tom painted a health poster 24 in. long and 18 in. wide. Then he made a frame to put around it. How many inches of wood did he need for the frame if he allowed nothing extra for corners? How many feet were there in the perimeter?

5. Alice has a garden 20 ft. long and 12 ft. 6 in. wide. She wants to put some wire netting around it to keep out the rabbits. How many feet of netting does she need?

Change 12 ft. 6 in. to $12\frac{1}{2}$ ft. because the length is given in feet. Both dimensions must be in the same unit of measure.

6. You can also work ex. 5 by changing both dimensions to inches. Then the perimeter is in inches. What would you do to get the perimeter in feet? Which is the better way to work the problem, this way or the one in ex. 5? Why?

7. What is the perimeter of a rectangle 1 ft. 5 in. long and 9 in. wide? Is it better to give the answer in feet or in inches?

Find the perimeters of rectangles with these dimensions:

| | | |
|---|---|---|
| 8. 7 yd. by 10 yd. | 10″ by 16″ | $4\frac{1}{2}' \times 8'$ |
| 9. 8 in. by 12 in. | 32″ by 40″ | $1\frac{1}{2}' \times 3\frac{1}{2}'$ |
| 10. 9 ft. by 15 ft. | 17″ by 33″ | $5\frac{1}{4}' \times 6\frac{3}{4}'$ |



Add and check:

| | | | | | | |
|---|---|---|---|---|---|---|
| 1. 123 | 198 | 265 | 249 | 971 | 716 | 124 |
| 537 | 734 | 784 | 723 | 444 | 282 | 598 |
| 786 | 443 | 473 | 862 | 229 | 421 | 964 |
| 648 | 970 | 539 | 325 | 367 | 843 | 547 |
| 965 | 669 | 701 | 488 | 658 | 598 | 239 |
| 454 | 585 | 892 | 513 | 262 | 301 | 860 |
| 102 | 321 | 616 | 631 | 514 | 677 | 656 |

Subtract and check:

| | | | | |
|---|---|---|---|---|
| 2. 71490 | 68061 | 33429 | 30000 | 94281 |
| 52832 | 53498 | 28662 | 17259 | 53746 |
| 3. 62843 | 57869 | 71645 | 71437 | 56053 |
| 12854 | 28593 | 44806 | 33469 | 26085 |

Multiply and check:

| | | | | | |
|---|---|---|---|---|---|
| 4. 328 | 748 | 916 | 573 | 4709 | 6372 |
| 410 | 365 | 287 | 750 | 83 | 29 |
| 5. 169 | 375 | 283 | 954 | 5169 | 8263 |
| 506 | 248 | 637 | 590 | 34 | 85 |

Divide and check. Write R before the remainder:

| | | | |
|---|---|---|---|
| 6. $14\overline{)1255}$ | $11\overline{)2742}$ | $74\overline{)59441}$ | $45\overline{)135937}$ |
| 7. $37\overline{)2148}$ | $19\overline{)3940}$ | $69\overline{)31543}$ | $18\overline{)132167}$ |

Find the answers:

| | | | |
|---|---|---|---|
| 8. $4\frac{5}{8} + 5\frac{1}{6} + 3\frac{1}{12}$ | $3\frac{1}{4} + 2\frac{1}{5} + 3\frac{3}{10}$ | $2\frac{1}{2} + 3\frac{3}{4}$ |
| 9. $2\frac{7}{10} + 3\frac{5}{8} + 4\frac{1}{4}$ | $5\frac{2}{3} + 3\frac{3}{4} + 2\frac{5}{6}$ | $1\frac{5}{8} + 2\frac{3}{8}$ |
| 10. $3\frac{5}{8} - 3\frac{3}{8}$ | $6\frac{1}{4} - 3\frac{13}{16}$ | $4\frac{5}{12} - 3\frac{5}{6}$ | $5\frac{1}{2} - 4\frac{9}{10}$ |
| 11. $\frac{5}{8} \times 7$ | $48 \times \frac{3}{4}$ | $1\frac{2}{3} \times 22$ | $10 \times 4\frac{1}{3}$ |

## JEAN WINS SEWING CHAMPIONSHIP

1. Jean is a member of a 4–H Club. She likes to sew and has learned to make some of her own clothes. This year Jean won the 4–H Sewing Championship in her state by making a jumper dress and a waist to go with it. For the dress she used $4\frac{1}{2}$ yd. of cloth at 79¢ a yard, 2 spools of thread at 5¢ each, and a card of hooks and eyes at 12¢ a card. How much money did the materials for the dress cost?



2. For the waist Jean bought $1\frac{1}{2}$ yd. of organdy at 44¢ a yard, $1\frac{1}{2}$ yd. of organdy trimming at $1.12 a yard, a spool of thread for 5¢, and a card of buttons for 35¢. What was the cost of the waist? What was the cost of the dress and the waist together? See ex. 1.

3. Last summer Jean made a skirt. She bought $2\frac{1}{2}$ yd. of seersucker at 89¢ a yard, $3\frac{1}{4}$ yd. of ribbon at 12¢ a yard, and a spool of thread for 5¢. How much did she pay for the materials for this skirt?

4. To make an apron Jean used $1\frac{1}{4}$ yd. of cotton print at 68¢ a yard, 3 cards of rickrack braid (1 card of red braid, 1 of white, and 1 of blue) at 10¢ a card, and 3 spools of thread (1 red, 1 white, and 1 blue) at 5¢ a spool. How much in all did the apron cost?

5. A gray wool skirt that Jean made took $1\frac{3}{4}$ yd. of wool cloth at $2.68 a yard, a spool of silk thread at 10¢, and hooks and eyes at 12¢. How much did the wool skirt cost?

6. Jean made a pocketbook to match her gray skirt. She covered a strong round box and its lid with $\frac{1}{4}$ yd. of gray wool like that in ex. 5 which cost $2.68 a yard. She also used $\frac{1}{4}$ yd. of satin which cost $1.16 a yard, and a spool of thread which cost 5¢. How much did she pay for the material for the pocketbook?

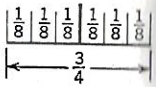
7. In a store Jean saw a pocketbook similar to hers, but not as well made. The price was $3.49. How much money had Jean saved by making her own pocketbook?

8. If Jean had bought in a store the things that she made, they would have cost these amounts: jumper dress, $6.95; waist, $3.49; cotton skirt, $2.98; apron, $1.50; wool skirt, $5.75. How much did Jean save by making these things instead of buying them? See ex. 1 to 5.

1. Mrs. Smith cut a small cake into halves. Then she cut $\frac{1}{2}$ of the cake into 3 equal pieces and gave a piece to each of 3 girls. What part of the *whole* cake did each girl get? What is $\frac{1}{3}$ of $\frac{1}{2}$?

Another way to write $\frac{1}{3}$ of $\frac{1}{2}$ is $\frac{1}{3} \times \frac{1}{2}$. The sign $\times$ written after a fraction means "of." You see that $\frac{1}{3} \times \frac{1}{2} = \frac{1}{6}$. $\frac{1}{3} \times \frac{1}{2}$ is read "$\frac{1}{3}$ times $\frac{1}{2}$" but it means $\frac{1}{3}$ of $\frac{1}{2}$.

2. Draw a line $\frac{3}{4}$ in. long. If you divide the line into 2 equal parts, how long will each part be? How long is $\frac{1}{2}$ of $\frac{3}{4}$ in.? You see that $\frac{3}{4}$ in. equals $\frac{6}{8}$ in. and that $\frac{1}{2}$ of 6 *eighths* equals 3 *eighths*, or $\frac{3}{8}$. So $\frac{1}{2}$ of $\frac{3}{4}$ in. $= \frac{3}{8}$ in. Likewise $\frac{1}{2} \times \frac{3}{4} = \frac{3}{8}$.




3. Instead of finding the answer to $\frac{1}{2} \times \frac{3}{4}$ by making a drawing, as was done in ex. 2, you can get the answer by multiplying the numerators of the fractions together and then multiplying the denominators together, as shown below at *A*. The answer is $\frac{3}{8}$.

$$A.\ \frac{1}{2} \times \frac{3}{4} = \frac{1 \times 3}{2 \times 4} = \frac{3}{8} \qquad B.\ \frac{3}{4} \times \frac{2}{3} = \frac{3 \times 2}{4 \times 3} = \frac{6}{12} = \frac{1}{2}$$

4. What does $\frac{3}{4} \times \frac{2}{3}$ equal? Do the work as shown above at *B*. The answer is $\frac{6}{12}$ which reduces to $\frac{1}{2}$.

Multiply. Reduce the answers to lowest terms when possible:

5. $\frac{1}{2} \times \frac{4}{5}$ $\quad \frac{2}{5} \times \frac{3}{4}$ $\quad \frac{1}{3} \times \frac{3}{8}$ $\quad \frac{3}{4} \times \frac{1}{6}$ $\quad \frac{4}{5} \times \frac{3}{8}$

6. $\frac{1}{8} \times \frac{3}{4}$ $\quad \frac{5}{8} \times \frac{1}{3}$ $\quad \frac{3}{8} \times \frac{1}{2}$ $\quad \frac{3}{5} \times \frac{5}{8}$ $\quad \frac{2}{3} \times \frac{1}{4}$

> To multiply a fraction by a fraction, first multiply the numerators together; then multiply the denominators together.



1. John had $\frac{3}{4}$ of a candy bar. He gave Jim $\frac{1}{3}$ of it. What part of the whole candy bar did Jim get?

2. Fred had $\frac{3}{4}$ lb. of candy. He gave Jack $\frac{1}{2}$ of it. What part of a pound did he give Jack?

3. Alice wants to make ice cream. The recipe calls for $\frac{3}{4}$ qt. of cream. Alice wants to make $\frac{2}{3}$ of the amount of the recipe. How much cream should she use?

4. Jane is making a cake. The recipe calls for $\frac{2}{3}$ cup of raisins. If Jane makes $\frac{1}{2}$ of the amount of the recipe, what part of a cup of raisins should she use?

5. Tom gathered $\frac{1}{2}$ bu. of nuts for his uncle. If Tom received $\frac{1}{2}$ the nuts, what part of a bushel of nuts did he get?

6. Dick can walk to Green Lake in $\frac{2}{3}$ hr. He says that he can ride to the lake in $\frac{1}{4}$ of that time. How long does it take Dick to ride to Green Lake?

Multiply. Reduce the answers to lowest terms when possible:

7. $\frac{1}{9} \times \frac{1}{6}$ $\quad \frac{3}{8} \times \frac{1}{2}$ $\quad \frac{1}{4} \times \frac{1}{2}$ $\quad \frac{1}{3} \times \frac{2}{5}$ $\quad \frac{1}{4}$ of $\frac{1}{4}$

8. $\frac{1}{5} \times \frac{1}{3}$ $\quad \frac{1}{3} \times \frac{1}{2}$ $\quad \frac{1}{2} \times \frac{3}{5}$ $\quad \frac{3}{4} \times \frac{1}{8}$ $\quad \frac{3}{8}$ of $\frac{3}{4}$

9. $\frac{1}{9} \times \frac{1}{5}$ $\quad \frac{2}{3} \times \frac{1}{3}$ $\quad \frac{7}{8} \times \frac{1}{2}$ $\quad \frac{1}{2} \times \frac{1}{2}$ $\quad \frac{1}{4}$ of $\frac{7}{8}$

10. $\frac{1}{5} \times \frac{3}{5}$ $\quad \frac{1}{3} \times \frac{1}{5}$ $\quad \frac{1}{4} \times \frac{1}{3}$ $\quad \frac{3}{4} \times \frac{3}{4}$ $\quad \frac{2}{3}$ of $\frac{5}{8}$

11. $\frac{1}{9} \times \frac{1}{3}$ $\quad \frac{3}{4} \times \frac{1}{2}$ $\quad \frac{1}{2} \times \frac{1}{8}$ $\quad \frac{1}{8} \times \frac{1}{4}$ $\quad \frac{1}{3}$ of $\frac{1}{8}$

12. $\frac{1}{4} \times \frac{1}{3}$ $\quad \frac{5}{6} \times \frac{1}{5}$ $\quad \frac{2}{3} \times \frac{3}{4}$ $\quad \frac{1}{5} \times \frac{1}{2}$ $\quad \frac{1}{6}$ of $\frac{3}{4}$

13. $\frac{1}{5} \times \frac{3}{8}$ $\quad \frac{5}{8} \times \frac{1}{2}$ $\quad \frac{1}{4} \times \frac{5}{8}$ $\quad \frac{5}{8} \times \frac{4}{5}$ $\quad \frac{1}{4}$ of $\frac{1}{8}$

14. $\frac{1}{9} \times \frac{1}{4}$ $\quad \frac{3}{8} \times \frac{3}{4}$ $\quad \frac{3}{4} \times \frac{8}{9}$ $\quad \frac{1}{4} \times \frac{3}{4}$ $\quad \frac{7}{8}$ of $\frac{3}{4}$

15. $\frac{1}{9} \times \frac{5}{6}$ $\quad \frac{3}{4} \times \frac{5}{6}$ $\quad \frac{2}{3} \times \frac{1}{2}$ $\quad \frac{4}{5} \times \frac{1}{3}$ $\quad \frac{3}{4}$ of $\frac{5}{8}$

16. $\frac{1}{6} \times \frac{1}{2}$ $\quad \frac{1}{2} \times \frac{9}{16}$ $\quad \frac{1}{2} \times \frac{1}{10}$ $\quad \frac{1}{2} \times \frac{3}{10}$ $\quad \frac{1}{2}$ of $\frac{11}{16}$

17. $\frac{2}{3} \times \frac{1}{4}$ $\quad \frac{3}{4} \times \frac{5}{12}$ $\quad \frac{1}{2} \times \frac{5}{12}$ $\quad \frac{1}{2} \times \frac{7}{12}$ $\quad \frac{1}{2}$ of $\frac{1}{12}$

18. $\frac{2}{3} \times \frac{3}{5}$ $\quad \frac{1}{2} \times \frac{9}{10}$ $\quad \frac{1}{2} \times \frac{3}{16}$ $\quad \frac{1}{2} \times \frac{5}{16}$ $\quad \frac{1}{5}$ of $\frac{5}{16}$

# CANCELLATION

1. When you reduce $\frac{12}{15}$ to lowest terms, you divide both 12 and 15 by 3, which gives $\frac{4}{5}$. Sometimes the work is done by cancellation, as shown below.

First divide 12 by 3, which gives 4; cross out 12 and write 4 above it. Then divide 15 by 3; cross out 15 and write 5 below it. The answer is $\frac{4}{5}$. When you divide both 12 and 15 by 3, you say that you *cancel* 3. To cancel 3 means to *divide by* 3.

$$\frac{\overset{4}{\cancel{12}}}{\underset{5}{\cancel{15}}} = \frac{4}{5}$$

2. Reduce by cancellation: $\frac{8}{12}$, $\frac{6}{9}$, $\frac{12}{14}$, $\frac{10}{18}$, $\frac{9}{12}$, $\frac{14}{21}$, $\frac{6}{10}$, $\frac{10}{15}$.

3. Multiply $\frac{5}{6}$ by $\frac{2}{3}$.

You can do the work in two different ways. In the first way, shown at *A*, multiply the numerators and denominators as usual, which gives $\frac{10}{18}$. Then reduce $\frac{10}{18}$ to $\frac{5}{9}$ by canceling 2 from 10 and 18. The answer is $\frac{5}{9}$. Think the step inside the dotted lines but do not write it.

*A*

$$\frac{2}{3} \times \frac{5}{6} = \boxed{\frac{2 \times 5}{3 \times 6}} = \frac{\overset{5}{\cancel{10}}}{\underset{9}{\cancel{18}}} = \frac{5}{9}$$

*B*

$$\frac{\overset{1}{\cancel{2}}}{3} \times \frac{5}{\underset{3}{\cancel{6}}} = \boxed{\frac{1 \times 5}{3 \times 3}} = \frac{5}{9}$$

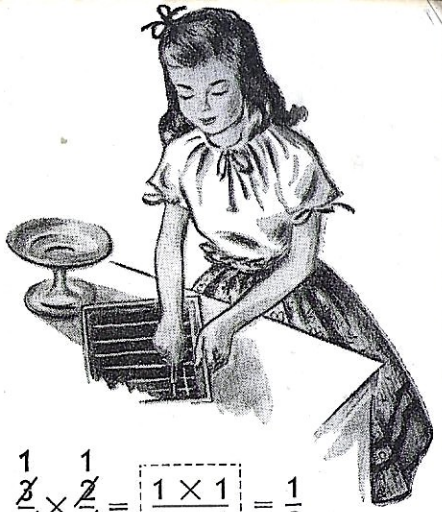
In the second way, shown at *B*, first cancel 2 from 2 and 6. Think "$2 \div 2 = 1$"; cross out 2 and write 1 above it. Think "$6 \div 2 = 3$"; cross out 6 and write 3 below it. Then multiply as shown inside the dotted lines. The answer $\frac{5}{9}$ is already reduced since you did the reducing when you divided both 2 and 6 by 2.

4. Find the answer to $3 \times \frac{2}{3}$.

First write 3 as $\frac{3}{1}$ and do the work as shown below:

$$3 \times \frac{2}{3} = \frac{\overset{1}{\cancel{3}}}{1} \times \frac{2}{\underset{1}{\cancel{3}}} = \boxed{\frac{1 \times 2}{1 \times 1}} = \frac{2}{1} = 2$$

# USING CANCELLATION



1. Sally's recipe for chocolate fudge calls for $\frac{2}{3}$ cup of milk. When Sally makes $\frac{3}{4}$ of her recipe for fudge she needs to find $\frac{3}{4}$ of $\frac{2}{3}$ cup of milk. How much milk does Sally use in $\frac{3}{4}$ of her recipe? How much does she use in $\frac{1}{2}$ of it?

Remember that $\frac{3}{4}$ of $\frac{2}{3}$ means $\frac{3}{4} \times \frac{2}{3}$. In this example you need to cancel twice. First cancel 2 from 2 and 4; then cancel 3 from 3 and 3. You see that Sally needs $\frac{1}{2}$ cup of milk.

$$\frac{\overset{1}{\cancel{3}}}{\underset{2}{\cancel{4}}} \times \frac{\overset{1}{\cancel{2}}}{\underset{1}{\cancel{3}}} = \boxed{\frac{1 \times 1}{2 \times 1}} = \frac{1}{2}$$

Multiply. Check the work by going over it:

| | | | | | |
|---|---|---|---|---|---|
| 2. | $\frac{8}{9} \times \frac{3}{16}$ | $\frac{4}{5} \times \frac{5}{16}$ | $\frac{2}{3} \times \frac{9}{10}$ | $\frac{5}{6} \times \frac{1}{10}$ | $\frac{2}{3} \times \frac{3}{4}$ |
| 3. | $\frac{8}{9} \times \frac{5}{12}$ | $\frac{2}{3} \times \frac{3}{10}$ | $\frac{4}{5} \times \frac{5}{12}$ | $\frac{4}{5} \times \frac{5}{8}$ | $\frac{7}{8} \times 4$ |
| 4. | $\frac{8}{9} \times \frac{5}{6}$ | $\frac{3}{5} \times \frac{5}{12}$ | $\frac{3}{8} \times 4$ | $\frac{2}{3} \times \frac{3}{5}$ | $\frac{3}{5} \times \frac{5}{12}$ |
| 5. | $\frac{1}{6} \times \frac{3}{16}$ | $\frac{5}{6} \times \frac{3}{4}$ | $\frac{2}{3} \times \frac{5}{8}$ | $\frac{1}{3} \times \frac{9}{16}$ | $10 \times \frac{1}{5}$ |
| 6. | $\frac{3}{4} \times \frac{1}{12}$ | $\frac{2}{3} \times \frac{7}{16}$ | $\frac{3}{4} \times \frac{11}{12}$ | $\frac{3}{8} \times \frac{2}{3}$ | $\frac{5}{12} \times \frac{3}{10}$ |
| 7. | $\frac{8}{9} \times \frac{1}{2}$ | $\frac{1}{6} \times \frac{3}{4}$ | $\frac{2}{5} \times \frac{5}{6}$ | $\frac{1}{6} \times \frac{3}{10}$ | $\frac{2}{3} \times \frac{7}{12}$ |
| 8. | $5 \times \frac{1}{10}$ | $\frac{2}{3} \times \frac{9}{16}$ | $\frac{5}{6} \times \frac{3}{10}$ | $\frac{2}{5} \times \frac{5}{16}$ | $\frac{1}{3} \times \frac{3}{10}$ |
| 9. | $4 \times \frac{3}{16}$ | $\frac{1}{3} \times \frac{9}{10}$ | $\frac{2}{3} \times \frac{5}{12}$ | $6 \times \frac{1}{12}$ | $\frac{2}{3} \times \frac{1}{4}$ |
| 10. | $\frac{8}{9} \times \frac{1}{16}$ | $\frac{5}{6} \times \frac{3}{16}$ | $\frac{5}{8} \times \frac{1}{10}$ | $4 \times \frac{7}{16}$ | $9 \times \frac{2}{3}$ |
| 11. | $\frac{3}{4} \times \frac{5}{12}$ | $\frac{2}{3} \times \frac{11}{12}$ | $8 \times \frac{11}{16}$ | $\frac{2}{3} \times \frac{5}{6}$ | $\frac{3}{5} \times 10$ |
| 12. | $8 \times \frac{3}{16}$ | $\frac{3}{4} \times \frac{7}{12}$ | $\frac{3}{4} \times \frac{1}{3}$ | $\frac{2}{3} \times \frac{15}{16}$ | $\frac{1}{10} \times \frac{2}{3}$ |

When you cancel in multiplying fractions, you divide a numerator of one fraction and a denominator of the other fraction each by the same number.

1. Blue Pond is $\frac{3}{8}$ mi. wide near Jack's house. Yesterday Jack skated across the lake 6 times. How many miles did he skate in all?

First write 6 as $\frac{6}{1}$. Divide 6 and 8 each by 2. Think "6 ÷ 2 = 3"; cross out 6 and write 3. Then think "8 ÷ 2 = 4"; cross out 8 and write 4. How many miles did Jack skate?

$$6 \times \frac{3}{8} = \frac{\overset{3}{\cancel{6}}}{1} \times \frac{3}{\underset{4}{\cancel{8}}} = \frac{9}{4} = 2\tfrac{1}{4}$$

2. Explain the work in each example and find the answer:

$$\frac{9}{10} \times \frac{5}{6} = \frac{\overset{3}{\cancel{9}}}{\underset{2}{\cancel{10}}} \times \frac{\overset{1}{\cancel{5}}}{\underset{2}{\cancel{6}}} = ? \qquad \frac{10}{21} \times \frac{14}{15} = \frac{\overset{2}{\cancel{10}}}{\underset{3}{\cancel{21}}} \times \frac{\overset{2}{\cancel{14}}}{\underset{3}{\cancel{15}}} = ?$$

Multiply. Check the work by going over it:

| | | | | | |
|---|---|---|---|---|---|
| 3. | $\frac{5}{12} \times \frac{9}{10}$ | $9 \times \frac{7}{12}$ | $\frac{4}{15} \times \frac{5}{6}$ | $\frac{5}{6} \times 14$ | $\frac{8}{15} \times \frac{3}{10}$ |
| 4. | $\frac{5}{16} \times 24$ | $\frac{5}{6} \times \frac{9}{16}$ | $\frac{1}{12} \times \frac{9}{10}$ | $\frac{1}{10} \times \frac{15}{16}$ | $\frac{3}{10} \times 12$ |
| 5. | $8 \times \frac{1}{6}$ | $\frac{8}{15} \times \frac{9}{10}$ | $\frac{7}{12} \times 8$ | $9 \times \frac{5}{6}$ | $\frac{3}{4} \times \frac{10}{9}$ |
| 6. | $\frac{4}{5} \times \frac{5}{6}$ | $\frac{1}{6} \times 15$ | $\frac{7}{8} \times \frac{6}{7}$ | $\frac{15}{16} \times \frac{3}{10}$ | $8 \times \frac{3}{10}$ |
| 7. | $\frac{4}{5} \times \frac{1}{10}$ | $6 \times \frac{5}{16}$ | $\frac{3}{4} \times 10$ | $\frac{10}{21} \times \frac{15}{16}$ | $\frac{7}{8} \times 20$ |
| 8. | $\frac{5}{8} \times 12$ | $8 \times \frac{7}{10}$ | $\frac{8}{9} \times \frac{9}{10}$ | $\frac{8}{3} \times \frac{11}{12}$ | $\frac{9}{10} \times \frac{4}{15}$ |
| 9. | $9 \times \frac{5}{12}$ | $\frac{5}{6} \times 15$ | $\frac{3}{8} \times \frac{10}{21}$ | $\frac{3}{8} \times 18$ | $\frac{3}{4} \times 6$ |

1. Jane read in the school library $\frac{3}{4}$ hr. on Monday, $1\frac{1}{2}$ hr. on Tuesday, $1\frac{1}{4}$ hr. on Wednesday, $1\frac{1}{2}$ hr. on Thursday, and 1 hr. on Friday. What was the average number of hours per day Jane read in the library?

2. Here is a record of the money Bill received and spent during a two weeks' period. Put it in the form of a cash account. He had \$.35 on hand on Nov. 1. He received \$.20 on Nov. 2 for running errand; \$1.00 on Nov. 3 for cleaning cellar; \$.35 on Nov. 6 for dusting car; \$1.10 on Nov. 10 for helping Mrs. White; \$.25 on Nov. 14 for taking care of dog. He spent \$.30 on Nov. 3 for movies; \$.15 on Nov. 7 for pad and pencil; \$1.15 on Nov. 12 for book; \$.50 on Nov. 14 for Red Cross. Find the balance at the end of the day on Nov. 14.

3. When she makes cocoa Helen allows $\frac{3}{4}$ teaspoon of sugar for each cup of cocoa. How many teaspoons of sugar does she need for 10 cups of cocoa?

4. How much do you save by buying a 1-pound jar of jam for \$.39 instead of two $\frac{1}{2}$-pound jars at \$.24 each?

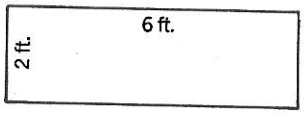
5. Jack's mother bought 2 doz. eggs at \$.45 a dozen, $\frac{1}{2}$ lb. of butter at \$.52 a pound, and a box of cookies for \$.35. What was her bill?

6. Sally is going to make cookies. The recipe calls for 1 cup of sugar. Sally wants to make only $\frac{3}{4}$ the amount of the recipe. How much sugar should she use?

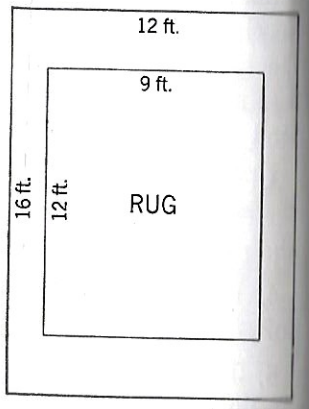
7. George's mother spent \$.60 for meat, \$.50 for vegetables, \$.16 for milk, \$.20 for rolls, and \$.50 for dessert for dinner for four persons. What was the average cost per person?

8. Mrs. Allen is cooking dinner for her family. She wants the roast to be done by 1 P.M. She has a $6\frac{1}{2}$-pound roast. If she cooks the meat 20 min. to the pound, at what time should she put the roast in the oven?

9. Mr. Brown averages about $32\frac{1}{2}$ mi. an hour in his car. At that rate, about how many miles does he drive in 8 hr.?




1. Here is a drawing of the top of Dick's indoor tennis table. The top is 2 ft. wide and 6 ft. long. Each $\frac{1}{4}$ in. on the drawing represents 1 ft. How many inches stand for 2 ft.? for 6 ft.? Measure the drawing with your ruler to see if it is right. This drawing is a *scale drawing* and is made to the scale of $\frac{1}{4}$ in. = 1 ft. The scale may be written $\frac{1}{4}'' = 1'$.




2. At the right is the plan that Tom drew of his room. The scale is $\frac{1}{8}'' = 1'$. How many inches represent 12 ft.? How many inches represent 16 ft.? Measure the plan to see if it is right. The rug on the floor is 12 ft. long and 9 ft. wide. Did Tom draw the rug correctly to the scale of $\frac{1}{8}'' = 1'$? If not, what change should be made?

3. Tom did not show the door and two windows that are in his room. If he had put them in the plan, how wide a space should he use in the drawing to represent the door which is 3 ft. wide? How wide a space should he use to represent each window, if the windows are 2 ft. wide?

4. A swimming pool is 75 ft. by 125 ft. Make a scale drawing of the pool using 1 in. to represent 25 ft.

5. Using a scale of 1 in. to 16 ft., tell the length of lines representing 40 ft.; 44 ft.; 88 ft.; 96 ft.

6. Make a scale drawing of a room that is 14 ft. long and 12 ft. wide. Use a scale of $\frac{1}{2}$ in. = 1 ft. On the floor draw a rug that is 6 ft. by 9 ft., using the same scale.

7. A tennis court is 27 ft. by 78 ft. Draw a plan of the court using a scale of $\frac{1}{4}$ in. = 3 ft.

1. A baseball diamond is a square 90 ft. on a side. On a sheet of paper draw a baseball diamond to the scale of 1 in. = 15 ft. Mark first base, second base, third base, and home plate.

2. Draw another plan of a baseball diamond letting the scale be $\frac{1}{2}$ in. = 10 ft.

Draw these rectangles to the scale of $\frac{1}{4}$ in. = 1 ft.:

| | | |
|---|---|---|
| 3. 8 ft. × 12 ft. | 15 ft. × 18 ft. | 16′ × 20′ |
| 4. 6 ft. × 10 ft. | 24 ft. × 24 ft. | 14′ × 17′ |

5. A map is a scale drawing. Suppose two cities are $1\frac{1}{4}$ in. apart on a map where the scale is 1 in. = 80 mi. Find the air-line distance between these cities.

6. Using a scale of $\frac{1}{4}$ in. to 1 mi., how long should the line be that represents 10 mi.? 20 mi.?

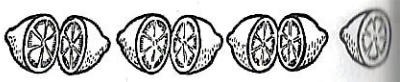
7. Using a scale of 1 in. to 75 mi., how long should the line be that represents a distance of 375 mi.?

8. George was looking at a map of the state of Pennsylvania. Its scale was 1 in. = 60 mi. With his ruler he measured the air-line distance between Philadelphia and Harrisburg and found it was $1\frac{1}{2}$ in. What is the actual distance between these two cities? What is the actual distance between cities that are $1\frac{1}{4}''$ apart on that map? that are $1\frac{3}{4}''$ apart?

9. Look at the scale on a map in one of your books. Try to use the scale to find the air-line distance between cities shown on the map.

1. Ann's mother has $3\frac{1}{2}$ lemons. How many glasses of lemonade can Ann make from $3\frac{1}{2}$ lemons if she uses $\frac{1}{2}$ lemon for each glass?

You must change $3\frac{1}{2}$ lemons to halves of a lemon.



You see by looking at the picture that there are 7 halves of a lemon in $3\frac{1}{2}$ lemons. Since there are 2 halves in 1 whole lemon, there are 6 halves in 3 whole lemons. This shows that $3 = \frac{6}{2}$. Then $3\frac{1}{2} = \frac{6}{2} + \frac{1}{2}$, or $\frac{7}{2}$. Since $3\frac{1}{2}$ lemons will make 7 halves of a lemon, Ann can make 7 glasses of lemonade.

A short way to change $3\frac{1}{2}$ to $\frac{7}{2}$ is to multiply 3 by 2 and add 1, which gives 7. Then write 7 over 2, which gives $\frac{7}{2}$.

> To change a mixed number to an improper fraction, multiply the whole number by the denominator, add the numerator, and place the result over the denominator.

Tell what number should be put in place of each star:

2. $4\frac{1}{2} = \frac{*}{2}$ $\quad 5\frac{1}{8} = \frac{*}{8}$ $\quad 2\frac{3}{5} = \frac{*}{5}$ $\quad 4\frac{1}{10} = \frac{*}{10}$ $\quad 1\frac{11}{12} = \frac{*}{12}$
3. $6\frac{1}{3} = \frac{*}{3}$ $\quad 1\frac{1}{6} = \frac{*}{6}$ $\quad 3\frac{3}{4} = \frac{*}{4}$ $\quad 2\frac{1}{16} = \frac{*}{16}$ $\quad 3\frac{3}{10} = \frac{*}{10}$
4. $3\frac{5}{8} = \frac{*}{8}$ $\quad 2\frac{2}{3} = \frac{*}{3}$ $\quad 1\frac{7}{8} = \frac{*}{8}$ $\quad 4\frac{11}{12} = \frac{*}{12}$ $\quad 1\frac{5}{16} = \frac{*}{16}$
5. $9\frac{1}{2} = \frac{*}{2}$ $\quad 4\frac{1}{4} = \frac{*}{4}$ $\quad 6\frac{1}{2} = \frac{*}{2}$ $\quad 3\frac{1}{15} = \frac{*}{15}$ $\quad 5\frac{7}{10} = \frac{*}{10}$

Change these mixed numbers to improper fractions:

6. $2\frac{3}{4}$ $\quad 3\frac{1}{7}$ $\quad 16\frac{1}{2}$ $\quad 6\frac{3}{8}$ $\quad 2\frac{5}{8}$ $\quad 3\frac{2}{3}$ $\quad 2\frac{7}{10}$
7. $7\frac{1}{3}$ $\quad 8\frac{1}{3}$ $\quad 12\frac{1}{2}$ $\quad 1\frac{1}{3}$ $\quad 6\frac{2}{3}$ $\quad 6\frac{3}{4}$ $\quad 4\frac{5}{12}$
8. $9\frac{1}{7}$ $\quad 5\frac{1}{4}$ $\quad 10\frac{2}{3}$ $\quad 4\frac{5}{6}$ $\quad 3\frac{7}{8}$ $\quad 4\frac{2}{5}$ $\quad 1\frac{7}{16}$
9. $5\frac{1}{2}$ $\quad 7\frac{1}{4}$ $\quad 11\frac{1}{8}$ $\quad 2\frac{5}{6}$ $\quad 3\frac{3}{7}$ $\quad 2\frac{3}{8}$ $\quad 3\frac{7}{12}$
10. $4\frac{1}{3}$ $\quad 3\frac{4}{5}$ $\quad 17\frac{1}{2}$ $\quad 7\frac{1}{5}$ $\quad 5\frac{5}{8}$ $\quad 1\frac{1}{2}$ $\quad 4\frac{9}{10}$



Addition Test 2a. Time: 4 min.

| | | | | | |
|---|---|---|---|---|---|
| 1. 375 | 756 | 456 | 173 | 454 | 324 |
| 759 | 643 | 237 | 838 | 865 | 947 |
| 893 | 897 | 749 | 284 | 768 | 728 |
| 422 | 265 | 613 | 558 | 191 | 949 |
| 206 | 514 | 372 | 745 | 352 | ⑥ 463 |

Addition Test 2b. Time: 4 min.

| | | | | | |
|---|---|---|---|---|---|
| 2. 640 | 743 | 290 | 855 | 193 | 963 |
| 456 | 358 | 558 | 449 | 802 | 798 |
| 813 | 894 | 993 | 867 | 665 | 735 |
| 169 | 127 | 612 | 673 | 487 | 471 |
| 128 | 536 | 141 | 334 | 274 | ⑥ 506 |

Addition Test 2c. Time: 4 min.

| | | | | | |
|---|---|---|---|---|---|
| 3. 743 | 489 | 483 | 456 | 954 | 376 |
| 557 | 672 | 868 | 295 | 895 | 124 |
| 985 | 348 | 569 | 763 | 676 | 727 |
| 474 | 856 | 132 | 589 | 327 | 398 |
| 316 | 503 | 254 | 117 | 232 | ⑥ 626 |

Improvement Tests.

## THE LANGUAGE OF ARITHMETIC

Show that you know what each word or phrase means by using it in a sentence or by giving an illustration of it:

4. minuend
5. quotient
6. account
7. billion
8. addend
9. check
10. perimeter
11. mixed number
12. difference
13. lowest terms
14. cash on hand
15. proper fraction
16. cancellation
17. dimensions
18. place value
19. subtrahend
20. balance
21. divisor

**1.** In the city where Mary lives it costs $2\frac{1}{2}$¢ per hour for electricity to run an electric toaster. Mary's family uses the toaster $\frac{3}{4}$ hr. per week for breakfast. How much does it cost per week to run the toaster for breakfast?

Find $\frac{3}{4}$ of $2\frac{1}{2}$. Change $2\frac{1}{2}$ to $\frac{5}{2}$. Then multiply $\frac{5}{2}$ by $\frac{3}{4}$. You cannot cancel in this example. It costs $1\frac{7}{8}$¢ to use the toaster for $\frac{3}{4}$ hr.

$$\frac{3}{4} \times 2\frac{1}{2} = \frac{3}{4} \times \frac{5}{2} = \frac{15}{8} = 1\frac{7}{8}$$

**2.** It costs $\frac{1}{4}$¢ per hour for electricity to light a small electric lamp. What does it cost to light the lamp for $2\frac{2}{3}$ hr.? It costs $3\frac{1}{3}$¢ per hour for electricity to use an electric flatiron. How much does it cost to use the flatiron for $2\frac{1}{4}$ hr.?

The cost of using the lamp for $2\frac{2}{3}$ hr. is worked out below at the left. What did it cost? Explain each step.

$$2\frac{2}{3} \times \frac{1}{4} = \frac{\overset{2}{\cancel{8}}}{3} \times \frac{1}{\underset{1}{\cancel{4}}} = \frac{2}{3} \qquad 2\frac{1}{4} \times 3\frac{1}{3} = \frac{\overset{3}{\cancel{9}}}{\underset{2}{\cancel{4}}} \times \frac{\overset{5}{\cancel{10}}}{\underset{1}{\cancel{3}}} = \frac{15}{2} = 7\frac{1}{2}$$

The cost of using the flatiron for $2\frac{1}{4}$ hr. is worked out above at the right. What did it cost? Explain the work.

**3.** It costs $1\frac{1}{3}$¢ for electricity to run a big fan for an hour. What does it cost to run it for $\frac{3}{4}$ hr.? What is $\frac{3}{4}$ of $1\frac{1}{3}$¢?

Tom worked this problem as shown below at the left. He was careful to put in the 1's when he canceled. He said that the answer is 1¢. Tom is right.

$$\frac{\overset{1}{\cancel{3}}}{\underset{1}{\cancel{4}}} \times \frac{\overset{1}{\cancel{4}}}{\underset{1}{\cancel{3}}} = \frac{1 \times 1}{1 \times 1} = 1 \qquad \frac{\cancel{3}}{\cancel{4}} \times \frac{\cancel{4}}{\cancel{3}} = 0$$

Bill did the work as shown above at the right. He did not write the 1's when he canceled. He said that the answer is 0 because everything is canceled. He said it didn't cost anything to run the fan. Why is Bill wrong?

## PROBLEMS AND PRACTICE

1. Fred and Henry are going on a hike of $5\frac{1}{2}$ mi. on Saturday. They plan to hike $\frac{1}{2}$ the distance in the morning. How far will they hike in the morning?

2. Helen has a recipe for making a cake that calls for $2\frac{1}{2}$ cups of flour. Helen wants to make a smaller cake using only $\frac{1}{2}$ the amounts of flour and other things given in the recipe. How many cups of flour should she use for the smaller cake?

3. Helen's recipe for making pudding calls for $1\frac{1}{2}$ cups of milk. If she makes $\frac{1}{2}$ the usual amount of pudding, how many cups of milk will she need?

Multiply. Cancel when you can. Check the work by going over it:

| | | | |
|---|---|---|---|
| 4. $\frac{1}{9} \times 3\frac{1}{2}$ | $\frac{5}{8} \times 1\frac{3}{10}$ | $\frac{2}{3} \times 1\frac{1}{8}$ | $\frac{9}{10} \times 1\frac{2}{3}$ |
| 5. $\frac{2}{3} \times 1\frac{1}{2}$ | $\frac{5}{12} \times 1\frac{1}{5}$ | $\frac{3}{10} \times 2\frac{1}{2}$ | $\frac{1}{6} \times 2\frac{1}{4}$ |
| 6. $\frac{9}{10} \times 1\frac{1}{3}$ | $\frac{1}{2} \times 2\frac{1}{2}$ | $\frac{3}{4} \times 1\frac{1}{5}$ | $\frac{3}{8} \times 1\frac{1}{4}$ |
| 7. $\frac{9}{10} \times 2\frac{2}{3}$ | $\frac{1}{10} \times 1\frac{7}{8}$ | $\frac{3}{8} \times 2\frac{2}{3}$ | $\frac{3}{4} \times 1\frac{1}{6}$ |
| 8. $\frac{3}{4} \times 5\frac{1}{3}$ | $\frac{4}{5} \times 1\frac{3}{4}$ | $\frac{1}{1}$ [illegible] $\times 2\frac{1}{2}$ | $\frac{1}{3} \times 1\frac{1}{2}$ |
| 9. $2\frac{1}{9} \times \frac{5}{8}$ | $5\frac{1}{3} \times \frac{3}{8}$ | $4\frac{4}{5} \times \frac{3}{8}$ | $1\frac{3}{5} \times \frac{9}{16}$ |
| 10. $1\frac{1}{5} \times \frac{1}{6}$ | $1\frac{1}{8} \times \frac{7}{12}$ | $2\frac{1}{2} \times \frac{1}{5}$ | $1\frac{1}{3} \times \frac{3}{10}$ |
| 11. $2\frac{2}{5} \times \frac{3}{4}$ | $2\frac{1}{2} \times \frac{3}{8}$ | $2\frac{2}{3} \times \frac{1}{6}$ | $1\frac{1}{5} \times \frac{5}{6}$ |
| 12. $1\frac{1}{9} \times 2\frac{1}{2}$ | $3\frac{1}{2} \times 2\frac{1}{2}$ | $1\frac{1}{2} \times 1\frac{1}{6}$ | $1\frac{1}{8} \times 3\frac{1}{3}$ |
| 13. $2\frac{1}{9} \times 1\frac{1}{8}$ | $1\frac{1}{4} \times 1\frac{3}{5}$ | $3\frac{3}{4} \times 2\frac{2}{3}$ | $1\frac{1}{5} \times \frac{5}{12}$ |
| 14. $2\frac{5}{8} \times 1\frac{1}{6}$ | $3\frac{1}{3} \times 1\frac{1}{4}$ | $1\frac{7}{8} \times 3\frac{1}{3}$ | $1\frac{3}{5} \times \frac{1}{8}$ |
| 15. $1\frac{3}{5} \times 1\frac{1}{2}$ | $\frac{2}{5} \times 4\frac{3}{8}$ | $1\frac{1}{3} \times 2\frac{1}{4}$ | $\frac{5}{6} \times 2\frac{5}{8}$ |
| 16. $7\frac{1}{9} \times 1\frac{1}{3}$ | $\frac{3}{4} \times 6\frac{2}{3}$ | $4\frac{1}{2} \times 2\frac{2}{3}$ | $3\frac{1}{7} \times 5\frac{1}{4}$ |

In each problem a fact is missing which you need to know before you can find the answer. Supply the missing fact and work the problem.

1. Alice bought a roll of red ribbon to tie up Christmas presents. She used 2 yd. of it on a present for her mother. How many yards of ribbon did she have left?

2. Jim bought a Scout knife for $1.25. Then he counted his money to see how much he had left. How much money did he have before he bought the knife?

3. Two boys bought a package of foreign stamps for 50¢. They shared the stamps and the cost equally. How much did each boy pay and how many stamps did each get?

4. Ann needs new tires for her bicycle. How much must she save to have enough money to buy 2 tires?

5. Betty plays the violin. She practices only $\frac{1}{2}$ as long on each school day as she practices on each Saturday. How long does Betty practice on each school day?

6. Tom went to the railroad station to meet his father and mother but the train was 50 min. late. At what time did the train arrive?

7. Mr. Wilson drove from Weston to Green Lake in 6 hr. What was his average speed per hour for the trip?

8. Mrs. King gave the grocer $5.00 to pay for the things she bought at his store. How much change did the grocer give Mrs. King?

9. Our school earned $75.50 by giving a Christmas fair. The money was divided equally among all the school clubs. What was each club's share of the money?

10. Each of the passengers on an airplane trip paid $78.85 for his ticket. How much did they pay all together?

11. Bill is planning to make a rectangular rabbit pen that will be 8 ft. longer than it is wide. How many feet of wire does he need to go around the pen?



A number like 415 is said to be *divisible* by 5, because it can be *exactly divided* by 5; 417, however, is not divisible by 5. It is often convenient to know whether a number is divisible by 2, 3, 5, or 9 without actually dividing the number to see. The rules below give quick ways to find out.

1. *A number is divisible by 5 if it ends in 0 or 5.*

415 and 320 are divisible by 5, but 214 and 321 are not.

2. *A number is divisible by 3 if the sum of its figures is divisible by 3.*

432 is divisible by 3 because $4 + 3 + 2 = 9$, and 9 is divisible by 3. 521 is not divisible by 3 because $5 + 2 + 1 = 8$, and 8 is not divisible by 3.

3. *A number is divisible by 9 if the sum of its figures is divisible by 9.*

4356 is divisible by 9 because $4 + 3 + 5 + 6 = 18$, and 18 is divisible by 9. 162 is also divisible by 9. 2135 is not divisible by 9 because $2 + 1 + 3 + 5 = 11$, and 11 is not divisible by 9.

4. *A number is divisible by 2 if it ends in 0, 2, 4, 6, or 8.*

468 is divisible by 2 because it ends in 8; but 437 is not divisible by 2 because it ends in 7.

5. A number that is divisible by 2 is called an *even number*. All even numbers end in 0, 2, 4, 6, or 8.

32, 50, 66, 148, and 1324 are all even numbers.

6. A number that is not divisible by 2 is called an *odd number*. All odd numbers end in 1, 3, 5, 7, or 9.

19, 117, 423, 381, and 6145 are all odd numbers.

Which of these numbers are divisible by 2? by 3? by 5? by 9? Use the rules above to find out:

| | | | | | | |
|---|---|---|---|---|---|---|
| 7. 285 | 423 | 250 | 741 | 312 | 1530 | 4734 |
| 8. 825 | 216 | 405 | 327 | 186 | 2824 | 7164 |
| 9. 411 | 524 | 183 | 531 | 702 | 6237 | 3420 |

1. An airplane traveled 621 mi. in 96 min. Find the average speed of the plane in miles per minute.

The airplane had a speed of $6\frac{45}{96}$ mi. per minute. In cases like this try to reduce $\frac{45}{96}$ to lowest terms. Use the tests of divisibility to help you find a number that will exactly divide both 45 and 96.

$$\begin{array}{r} 6\frac{45}{96} = 6\frac{15}{32} \\ 96\overline{)621} \\ 576 \\ \hline 45 \end{array}$$

You see that 96 is divisible by 2 but 45 is not. So you cannot divide both terms by 2. Try 5. 45 is divisible by 5 but 96 is not. So you cannot use 5. Try 3. 45 is divisible by 3 because $4 + 5 = 9$, and 9 is divisible by 3. 96 is also divisible by 3 because $9 + 6 = 15$, and 15 is divisible by 3. Dividing both terms of $\frac{45}{96}$ by 3, you get $\frac{15}{32}$. The speed of the airplane was $6\frac{15}{32}$ mi. per minute.

2. Reduce $\frac{90}{135}$ to lowest terms.

You see that 90 is divisible by 5 since 90 ends in 0. 135 is also divisible by 5 since 135 ends in 5. Dividing both terms of $\frac{90}{135}$ by 5, you get $\frac{18}{27}$ which reduces to $\frac{2}{3}$.

You can also reduce $\frac{90}{135}$ another way. 135 is divisible by 9 because $1 + 3 + 5 = 9$. 90 is also divisible by 9. Dividing both terms of $\frac{90}{135}$ by 9, you get $\frac{10}{15}$ which reduces to $\frac{2}{3}$. Both ways give the same answer.

3. What part of an hour is 25 min.? 42 min.? 36 min.?

25 min. is $\frac{25}{60}$ of an hour. Reduce $\frac{25}{60}$ to lowest terms.

4. What part of a mile is 660 ft.? 880 ft.? 3960 ft.?

Reduce to lowest terms. Use the tests on page 101:

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 5. | $\frac{35}{60}$ | $\frac{24}{75}$ | $\frac{42}{84}$ | $\frac{64}{96}$ | $\frac{54}{117}$ | $\frac{225}{315}$ | $\frac{189}{504}$ |
| 6. | $\frac{54}{96}$ | $\frac{25}{80}$ | $\frac{45}{87}$ | $\frac{85}{90}$ | $\frac{75}{165}$ | $\frac{375}{450}$ | $\frac{249}{297}$ |
| 7. | $\frac{27}{75}$ | $\frac{32}{96}$ | $\frac{28}{60}$ | $\frac{63}{78}$ | $\frac{135}{180}$ | $\frac{270}{315}$ | $\frac{441}{630}$ |
| 8. | $\frac{56}{84}$ | $\frac{48}{72}$ | $\frac{36}{75}$ | $\frac{64}{88}$ | $\frac{96}{144}$ | $\frac{270}{405}$ | $\frac{216}{720}$ |
| 9. | $\frac{75}{90}$ | $\frac{42}{48}$ | $\frac{80}{96}$ | $\frac{42}{56}$ | $\frac{45}{120}$ | $\frac{130}{195}$ | $\frac{144}{198}$ |

Using tests of divisibility.



1. The air distance between two cities is 2955 mi. If a plane makes a non-stop flight at an average rate of 225 mi. per hour, how many hours will the trip take?

You must divide 2955 by 225. Use the same five steps which you use with a two-figure divisor.

1. *Divide* 295 by 225. Think "2 ÷ 2 gives 1." Write 1 in the quotient over the last figure of 295.
2. *Multiply* 225 by 1, getting 225.
3. *Subtract* 225 from 295, which leaves 70.
4. *Compare* 70 with 225 to see that it is smaller.
5. *Bring down* 5 and write it after 70, making 705.

$$\begin{array}{r} 13\frac{30}{225} = 13\frac{2}{15} \\ 225\overline{)2955} \\ 225 \\ \hline 705 \\ 675 \\ \hline 30 \end{array}$$

Repeat these five steps to get the second quotient figure.

1. *Divide* 705 by 225. Think "There are three 2's in 7." Tell how to finish the work.

The quotient is $13\frac{2}{15}$. The trip will take $13\frac{2}{15}$ hr. Check by multiplying 225 by 13 and adding 30.

> When the second figure of the divisor is 1, 2, 3, 4, or 5, divide by the first figure of the divisor to estimate the quotient figure.

Divide and check. Write remainders, if any, as fractions in the quotients and reduce the fractions to lowest terms:

| | | | |
|---|---|---|---|
| 2. 338)8450 | 741)55575 | 819)181035 | 437)153387 |
| 3. 952)7920 | 238)60690 | 243)236736 | 627)162393 |
| 4. 412)9888 | 429)27456 | 624)229056 | 406)238728 |

1. Mr. Bates kept a record of all the eggs his hens laid last year. There were 477,658 in all. He kept 658 eggs for use at home and shipped the rest in cases of 360 eggs each. How many cases of eggs did he ship?

You must divide 477,000 by 360.

Since the second figure of 360 is 6, divide by 4, instead of 3, to estimate each quotient figure. 4 is 1 more than the first figure of 360. You divide by 4 because 360 is nearer to 400 than it is to 300. Think "4 ÷ 4 = 1." Multiply 360 by 1 and subtract it from 477. This leaves 117 which is less than 360.

To find the second quotient figure, divide 11 by 4 which gives 2. Multiply 360 by 2 which gives 720. Subtract 720 from 1170 which gives 450; 450 is *larger* than 360. This shows that 2 is *too small* for the quotient figure. Try 3. Why is 3 right?

```
      1325
360)477000
    360
    1170
    1080
      900
      720
      1800
      1800
```

Tell how to finish the work.

The answer is 1325. Mr. Bates shipped 1325 cases of eggs last year. How do you check the work?

> When the second figure of the divisor is 6, 7, 8, or 9, divide by 1 more than the first figure of the divisor to estimate the quotient figure.

Divide. Check by multiplying:

2. 493)327352 685)497995 897)1280019

3. 692)357764 871)677638 195)1608555

4. 383)238992 297)174042 567)2165473



Subtraction Test 2a. Time: 4 min.

| | | | | |
|---|---|---|---|---|
| 1. $12.14 | $33.10 | $23.04 | $50.00 | $41.26 |
| 2.47 | 12.32 | 8.63 | 44.07 | 1.42 |
| 2. $45.43 | $34.71 | $80.38 | $45.17 | $92.03 |
| 13.58 | 9.27 | 12.59 | 8.32 | 75.77 |
| 3. $67.82 | $96.05 | $42.83 | $32.69 | $67.51 |
| 9.55 | 47.36 | 17.35 | 7.93 (15) | 37.76 |

Subtraction Test 2b. Time: 4 min.

| | | | | |
|---|---|---|---|---|
| 4. $73.94 | $21.16 | $94.85 | $29.60 | $34.25 |
| 34.55 | 7.93 | 68.32 | 13.69 | 15.37 |
| 5. $53.72 | $64.52 | $70.79 | $30.00 | $58.31 |
| 44.73 | 6.85 | 57.92 | 4.26 | 35.64 |
| 6. $76.59 | $58.31 | $46.81 | $92.10 | $44.72 |
| 48.63 | 4.76 | 27.83 | 47.64 (15) | 9.16 |

Subtraction Test 2c. Time: 4 min.

| | | | | |
|---|---|---|---|---|
| 7. $19.53 | $20.00 | $44.58 | $37.32 | $36.18 |
| 7.79 | 18.52 | 10.62 | 32.59 | 4.49 |
| 8. $62.72 | $54.87 | $84.31 | $51.46 | $50.02 |
| 14.86 | 5.38 | 66.22 | 13.87 | 4.28 |
| 9. $75.31 | $33.19 | $26.23 | $53.49 | $79.50 |
| 8.43 | 17.62 | 5.27 | 23.85 (15) | 33.64 |

Improvement Tests.

1. Study carefully the examples below:

```
       108                $     2.60                3007
424)45792            561)$1458.60            456)1371203
    424                   1122                   1368
     3392                  336 6                   3203
     3392                  336 6                   3192
                              0                      11
```

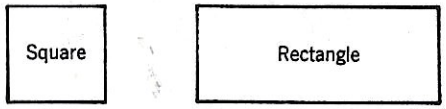
Divide and check. Write remainders, if any, as fractions in the quotients and reduce the fractions to lowest terms:

| | | |
|---|---|---|
| 2. 435)393240 | 688)1410400 | 346)$1871.86 |
| 3. 733)510168 | 632)3161264 | 288)$1555.56 |
| 4. 538)379290 | 840)4421200 | 975)$7264.50 |
| 5. 115)105595 | 919)7388760 | 182)$1283.10 |
| 6. 117)107187 | 389)1948112 | 862)$6085.72 |
| 7. 590)193620 | 409)3421285 | 721)$4859.54 |
| 8. 148)889332 | 953)3573750 | 581)$4287.78 |
| 9. 750)565500 | 184)1304928 | 619)$4141.11 |
| 10. 291)140262 | 573)3439146 | 297)$1247.94 |
| 11. 165)137115 | 720)6231024 | 575)$4381.75 |
| 12. 253)195822 | 682)3069000 | 420)$3804.15 |
| 13. 718)459520 | 175)1746850 | 447)$3361.46 |

Zeros in the quotient.



1. A square and a rectangle are illustrated below. Each of these figures has four sides and four *square corners*. The square corners are called *right angles*.

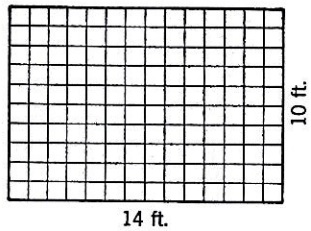



2. All four sides of a square are the same length. In a rectangle two sides may be longer than the other two sides.

3. To measure the *length* and *width* of a square or rectangle, you use linear measure. If it is a small rectangle, like a sheet of paper, you find how many *inches* long and wide it is. If it is a large rectangle, like a floor, you find how many *feet* long and wide it is.

4. To measure the *area* of a square or rectangle, you use square measure and find how many *square inches* or *square feet* it contains. A *square inch* is a square having each side 1 in. long. A *square foot* is a square having each side 1 ft. long. What is a square yard?

5. Bob wants to paint the floor of his room which is 10 ft. by 14 ft. He wondered how many square feet of floor he had to paint. He drew a figure like the one at the right and said, "There are 14 square feet in the top row and there are 10 rows. So the area of the floor of my room is 10 × 14 sq. ft., or 140 sq. ft." In finding the area of a rectangle, the length and the width of the rectangle must *both* be given in inches, or in feet, or in yards.




To find the area of a rectangle, multiply its length by its width.

## SQUARE MEASURE

1. Mr. Allen is having a cement sidewalk laid in front of the house. The walk is 3 ft. wide and 27 ft. long. How many square feet of sidewalk do the men have to lay?

2. How many yards wide is the walk? How many yards long is it? How many square yards of walk will there be?

3. Mrs. White wants new linoleum for the kitchen floor. The kitchen is 12 ft. by 15 ft. How many square yards of linoleum must she buy? Change both dimensions to yards.

4. Mr. Lewis wants to put a new tile floor in the bathroom which is 6 ft. wide and 12 ft. long. How many square feet of tile floor will there be?

5. How many square feet are there in a floor 10 ft. 6 in. wide and 12 ft. long?

Both dimensions must be given in the same unit of measure, so change 10 ft. 6 in. to $10\frac{1}{2}$ ft.; then multiply $10\frac{1}{2}$ by 12.

Find the areas of these rectangles. Before multiplying express both dimensions in the same unit:

| | | | |
|---|---|---|---|
| 6. | 8 in. × 10 in. | 6 ft. 4 in. × 9 ft. | 3 yd. 1 ft. × 5 yd. |
| 7. | 2 ft. × 36 in. | 9 ft. 6 in. × 12 ft. | 6 yd. 2 ft. × 9 yd. |
| 8. | 4 yd. × 15 ft. | 8 ft. 9 in. × 20 ft. | 8 yd. 1 ft. × 15 yd. |
| 9. | 45 ft. × 64 ft. | 7 ft. 2 in. × 18 ft. | 6 yd. 2 ft. × 24 yd. |





1. A small piece of land, like a flower garden, is measured by the *square foot* or the *square yard*. A larger piece of land, like a farm, is measured by the *acre*. An acre contains 43,560 sq. ft. Find the area of a square piece of land measuring 209 ft. on each side. Does this square contain about an acre? Is it a little more or a little less than an acre?

2. Find the area of a square measuring 208 ft. on each side. Is the area more or less than an acre? Which is closer to an acre, a square measuring 209 ft. on each side or one measuring 208 ft. on each side?

3. On the playground measure off a square that is 209 ft. on each side. This will give you an idea of the size of an acre.

4. Very large areas of land are measured by the *square mile*. The area of Rhode Island, the smallest state in the United States, is 1058 sq. mi. The area of Texas, the largest state, is 263,644 sq. mi. What is the area of the United States in square miles? Look in a geography or an encyclopedia to find the area.

5. Learn this table of square measure:

| | | |
|---|---|---|
| 144 square inches | = | 1 square foot (sq. ft.) |
| 9 square feet | = | 1 square yard (sq. yd.) |
| 43,560 square feet | = | 1 acre (A.) |
| 640 acres | = | 1 square mile (sq. mi.) |

6. Mr. Allen has a rectangular piece of land 200 ft. wide and 650 ft. long. Does he have about 2 acres or about 3 acres of land?

7. A field containing $16\frac{1}{2}$ acres of land was sold at $45 an acre. How much was paid for the field?

8. Mr. Wells built a house on a rectangular lot 110 ft. long and 99 ft. wide. What part of an acre is the lot?

1. In a certain city, 20 blocks running north and south are about equal to a mile. About how many feet long is each of these blocks?

2. In the same city, 12 blocks running east and west are about equal to a mile. About how many feet long is each of these blocks?

3. Allowing 1 lb. of grass seed to every 300 sq. ft. of lawn, how many pounds of grass seed do you need for a lawn 30 ft. by 50 ft.?

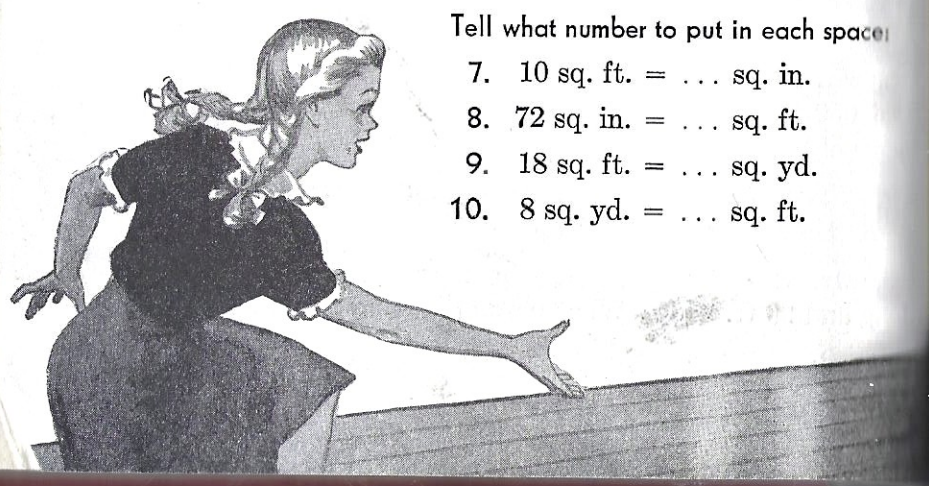
4. If 1 gal. of floor varnish will cover 600 sq. ft., how many gallons will be needed to varnish a floor 36 ft. long and 25 ft. wide?

5. Mrs. Adams wants to put linoleum on her kitchen floor which is 12 ft. wide and 15 ft. long. The linoleum comes in strips 6 ft. wide. These strips are sold by the "running foot." If one buys 10 running feet of linoleum, one gets a piece 10 ft. long and 6 ft. wide. How many running feet of this linoleum should Mrs. Adams buy to have enough to cover her kitchen floor? How much will this linoleum cost at $.95 per running foot? Draw a diagram showing how to cut the linoleum and lay it on the floor so that the floor will be covered and there will be no waste.

6. Mr. Bell had a new cement floor laid in his garage. The floor contains 315 sq. ft. How many square yards is that?

Tell what number to put in each space:

7. 10 sq. ft. = . . . sq. in.
8. 72 sq. in. = . . . sq. ft.
9. 18 sq. ft. = . . . sq. yd.
10. 8 sq. yd. = . . . sq. ft.





1. George is going to make a rectangular yard for his puppy. The yard will be 18 ft. long and 5 ft. wide. How many feet of wire fencing will he need for the yard?

2. A rectangle is 60 yd. by 80 yd. Tom's scale drawing of the rectangle is 3 in. by 4 in. How many yards does 1 in. stand for on Tom's drawing?

3. The town is laying a new sidewalk in front of the school. The walk is 5 ft. wide and 288 ft. long. What will it cost at $9.70 a square yard?

4. Jane bought $2\frac{1}{2}$ doz. eggs at $.45 a dozen and $\frac{3}{4}$ lb. of beans at $.24 a pound. How much did these things cost?

5. A recipe calls for $1\frac{1}{2}$ cups of milk. If you make one half the recipe, how much milk should you use?

6. How much change will you get from $1.00 if you buy $\frac{1}{2}$ doz. cookies at $.35 a dozen and a coffee cake for $.40?

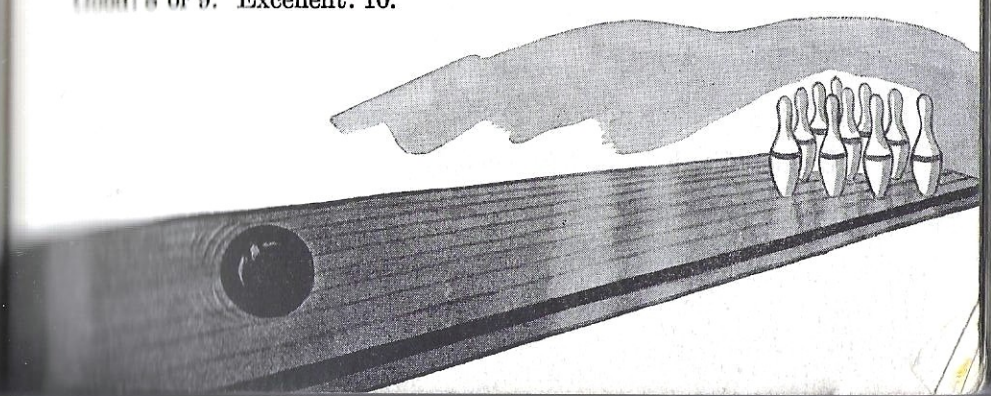
7. Jack bought $\frac{3}{4}$ lb. of hard candy. He gave his brother $\frac{1}{3}$ of it. What part of a pound did he give his brother?

8. Our school paid $273.00 for 325 music books. What was the cost of each book?

9. There are $16\frac{1}{2}$ ft. in a rod. How many feet long is a field that is $12\frac{2}{3}$ rd. long?

10. On a map the air-line distance from Albany to Rochester is $3\frac{1}{4}$ in. How many miles is it from Albany to Rochester if the scale of the map is 1 in. = 60 mi.?

Poor: 0 to 5 right. Fair: 6 or 7.
Good: 8 or 9. Excellent: 10.



1. Which has the greater area, a rectangle 4 ft. by 6 ft. or a 5-foot square? Which has the greater perimeter?

2. On a map on which 1 in. = 150 mi., two cities are $2\frac{1}{2}$ in. apart. What is the distance between them?

3. If you draw a map to a scale of 1 in. = 100 ft., how many feet are represented by $\frac{1}{2}$ in.? by $\frac{1}{4}$ in.? by $\frac{1}{8}$ in.?

4. The school playground is 350 ft. by 475 ft. Using a scale of $\frac{1}{2}$ in. = 50 ft., how many inches wide and long would you make the drawing of the field?

5. At 40¢ an hour, how much will John receive if he works $3\frac{1}{2}$ hr. for Mrs. Thomas?

6. At the fruit store grapefruit sells at 2 for 25¢. How much will you have to pay for 1 grapefruit?

7. A cake recipe calls for $1\frac{1}{2}$ cups of sugar. How many cups of sugar will you need if you use $1\frac{1}{2}$ times as much of each thing as the recipe requires?

8. At the food sale, muffins are selling at \$.36 a dozen. How much should Ann charge for 8 muffins? for 9 muffins?

9. How do you change square inches to square feet?

10. Which of these numbers are divisible by 2? by 3?

342 153 480 471 855 1305 2174

11. Which of these numbers are divisible by 3? by 9?

261 204 327 195 711 4752 3510

12. Reduce these fractions to lowest terms:

$\frac{36}{96}$ $\frac{40}{95}$ $\frac{35}{100}$ $\frac{44}{52}$ $\frac{105}{360}$ $\frac{36}{144}$ $\frac{64}{136}$ $\frac{315}{468}$

Multiply and check the work:

13. $\frac{3}{8} \times 144$ $4\frac{1}{2} \times 2\frac{2}{3}$ $\frac{15}{16} \times \frac{12}{25}$ $1\frac{3}{4} \times 35$

Divide. Check the work by multiplying:

14. $306\overline{)\$1187.28}$ $638\overline{)5445968}$ $262\overline{)1223529}$



If you miss more than one example in any row, turn to the Practice Page for that row.

| | | | | | PRACTICE PAGES |
|---|---|---|---|---|---|
| Change these mixed numbers to fractions: | | | | | |
| 1. $3\frac{3}{4}$ | $7\frac{1}{2}$ | $5\frac{3}{8}$ | $3\frac{5}{6}$ | $2\frac{5}{12}$ | 96 |
| Multiply and check the work: | | | | | |
| 2. $\frac{3}{8} \times 24$ | $\frac{3}{4} \times 32$ | $\frac{7}{8} \times 64$ | | | 76 |
| 3. $\frac{1}{3} \times 17$ | $\frac{3}{4} \times 13$ | $\frac{3}{5} \times 16$ | | | 77 |
| 4. $2\frac{1}{3} \times 18$ | $3\frac{2}{3} \times 25$ | $4\frac{1}{8} \times \$1.50$ | | | 79 |
| 5. $8 \times 5\frac{1}{4}$ | $25 \times 13\frac{1}{2}$ | $16 \times 14\frac{2}{5}$ | | | 80 |
| 6. $\frac{1}{3} \times \frac{1}{4}$ | $\frac{3}{4} \times \frac{1}{5}$ | $\frac{3}{5} \times \frac{3}{8}$ | | | 89 |
| 7. $\frac{3}{8} \times \frac{4}{5}$ | $\frac{1}{4} \times \frac{4}{5}$ | $\frac{5}{6} \times \frac{3}{10}$ | | | 91 |
| 8. $9 \times \frac{5}{12}$ | $\frac{5}{6} \times \frac{9}{10}$ | $\frac{3}{8} \times \frac{10}{21}$ | | | 92 |
| 9. $\frac{3}{4} \times 7\frac{1}{2}$ | $\frac{3}{4} \times 2\frac{1}{4}$ | $\frac{3}{10} \times 3\frac{1}{3}$ | | | 99 |
| 10. $1\frac{1}{4} \times \frac{9}{10}$ | $1\frac{1}{2} \times \frac{2}{3}$ | $2\frac{2}{5} \times \frac{5}{6}$ | | | 99 |
| 11. $1\frac{1}{8} \times 1\frac{1}{2}$ | $1\frac{7}{8} \times 1\frac{1}{5}$ | $3\frac{1}{3} \times 4\frac{1}{2}$ | | | 99 |
| Divide and check. Write remainders as fractions: | | | | | |
| 12. $342\overline{)17784}$ | $258\overline{)185274}$ | $453\overline{)155430}$ | | | 103 |
| 13. $134\overline{)96480}$ | $647\overline{)43349}$ | $911\overline{)276944}$ | | | 103 |
| 14. $288\overline{)133128}$ | $467\overline{)1786742}$ | $675\overline{)158760}$ | | | 104 |
| 15. $193\overline{)164436}$ | $780\overline{)1120080}$ | $273\overline{)222495}$ | | | 104 |
| 16. $538\overline{)378752}$ | $987\overline{)9697575}$ | $791\overline{)4749955}$ | | | 106 |
| 17. $915\overline{)186660}$ | $742\overline{)4489100}$ | $925\overline{)2481875}$ | | | 106 |

Diagnostic test.

CHAPTER FOUR

# Decimals

## RAISING TURKEYS

1. Jack lives on a farm. This year he wanted to raise turkeys as his 4–H Club project so he bought 20 young turkeys at $.75 each. How much did he pay for them?

2. To raise the turkeys Jack spent $60.06 for equipment and $33.32 for feed. How much did he spend all together? Include the cost of the turkeys found in ex. 1.

3. Jack raised all but one of the turkeys and sold them for $120.70. How much more did he get for the turkeys than he spent? See ex. 2.

4. Next year Jack will not have to buy any equipment. If he buys 20 young turkeys then at $.75 each and pays $35.00 for feed, how much money in all will he spend? If he sells the turkeys next year for $130.00, how much money will he make then?

5. Why will Jack make so much more money next year than he did this year?

6. Jack heard about a new breed of turkey that weighs an average of 23 lb. per turkey when dressed for market. If dressed turkeys sell at $.56 per pound, how much would he get for a turkey of this weight?

7. A hen turkey is also valuable for its eggs. A hen turkey might lay an average of 86 eggs in a season. If these were sold at $.32 each, how much would they bring?

8. Jack read about a prize hen turkey that laid 140 eggs in a season. What would they bring at $.32 each?

1. Common fractions like $\frac{9}{10}$, $\frac{42}{100}$, and $\frac{135}{1000}$, which have denominators of 10, 100, and 1000, may be written as decimals. For example, the fraction $\frac{9}{10}$ may be written as the decimal .9; in this case only the numerator 9 of the fraction is written and a decimal point is placed before it. When the denominator of the fraction is 10, the decimal has only 1 place.

In the same way, $\frac{42}{100}$ may be written as the decimal .42. When the denominator is 100, the decimal has 2 places.

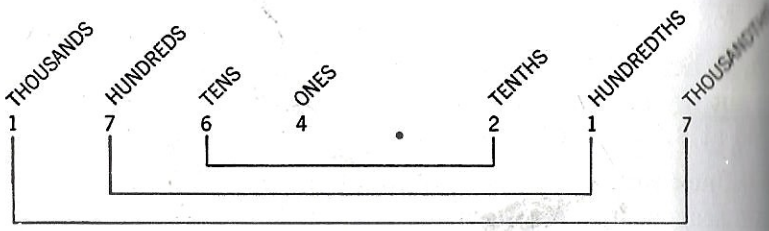
*When a fraction is written as a decimal, the decimal must have as many places to the right of the decimal point as there are zeros in the denominator of the fraction.*

2. When $\frac{5}{100}$ is written as a decimal, the decimal must have 2 places since the denominator of $\frac{5}{100}$ has 2 zeros. So $\frac{5}{100}$ is written .05; the zero is put before the 5 so that the decimal will have 2 places.

3. The fraction $\frac{375}{1000}$ is written as the decimal .375; $\frac{75}{1000}$ is written .075; while $\frac{7}{1000}$ is written .007. Each of these 3 decimals has 3 places because there are 3 zeros in the denominator 1000.

4. A number like 6348.325, which consists of a whole number and a decimal, is called a *mixed decimal.*

5. Memorize the names of the decimal places. Starting at the decimal point and counting *toward the right,* the places are *tenths, hundredths, thousandths,* as shown below.






1. Study the figure at the bottom of page 116. In this figure, if you count from *ones* place instead of counting from the decimal point, the places to the *left* of *ones* place are *tens, hundreds, thousands* while the places to the *right* of *ones* place are *tenths, hundredths, thousandths.*

2. The only difference between the words *tens* and *tenths* is that *tenths* has the extra letters *th* before the *s.* What is the difference between the words *hundreds* and *hundredths?* between the words *thousands* and *thousandths?*

3. To read a decimal, read it as a whole number and then give it the name of the place of its *last figure.* For example, .56 is read 56 *hundredths* because 6 is in *hundredths* place; .07 is read 7 *hundredths* because 7 is in *hundredths* place; .023 is read 23 *thousandths* because 3 is in *thousandths* place. A mixed decimal like 27.4 is read 27 and 4 *tenths;* in this case the decimal point is read *and.*

4. In business a number like 207.43 is often read *two-o-seven-point-four-three.* Zero is read like the letter o.

5. The decimal 0.8 means .8. When there is no figure at the left of the decimal point, a zero is often written there to call attention to the decimal point.

Write each number as a decimal or a mixed decimal:

6. $\frac{7}{10}$ $\frac{31}{100}$ $\frac{417}{1000}$ $\frac{6}{100}$ $\frac{29}{1000}$ $\frac{9}{1000}$ $\frac{37}{10}$ $\frac{523}{100}$

Read each decimal as explained in ex. 3:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 7. | .8 | .65 | .179 | .06 | .053 | .001 | 13.09 | 5.067 |
| 8. | .1 | 0.3 | 0.43 | .18 | 0.05 | 0.50 | 6.127 | 2.003 |

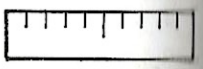
9. Read each decimal in ex. 7 as explained in ex. 4.

10. Write each number in ex. 7 and 8 as a common fraction or a mixed number. If the name of the decimal is hundredths, the denominator of the fraction will be 100; if the name of the decimal is thousandths, the denominator will be 1000.

## HOW DEEP IS THE SNOW?

**1.** In the winter when there is a fall of snow, the Weather Bureau reports the depth of the snow in inches. For example, in New York the day after the severe blizzard of March 12, 1888, the Weather Bureau reported that 16.5 in. of snow fell during the 24-hour period. Weather reports are given daily in the newspapers.

**2.** The Weather Bureau gives the depth of the snow to *tenths* of an inch instead of using *quarters* or *eighths* of an inch. When measurements are made to *tenths* of an inch, the inch is divided into 10 equal parts, as shown at the right. The ruler which you use in school shows *quarters* and *eighths* of an inch. Is $\frac{1}{8}$ of an inch a little longer or a little shorter than $\frac{1}{10}$ of an inch? Put your ruler under the picture of the inch, shown above, to see how $\frac{1}{8}$ in. on your ruler compares with $\frac{1}{10}$ in.



**3.** One day 3.3 in. of snow fell. The next day 2.6 in. more fell. How many inches of snow fell on both days?

**4.** The depth of the snow is measured by means of a rod, marked in inches and tenths of an inch, which is pushed vertically into the snow. When the wind causes the snow to drift so that it is deeper in one place than another, the depth of the snow is measured at several different places and the average of these measurements is found. This average, which is computed to tenths of an inch, is the one reported by the Weather Bureau.

**5.** One day the Weather Bureau measured the depth of the snow at the end of the 24-hour period. Five measurements were made at different places as follows: 3.4 in., 3.3 in., 3.4 in., 3.5 in., 3.4 in. Find the average snowfall. Add the numbers and divide the sum as you would divide dollars and cents. What was the average depth of the snow?

$$\begin{array}{r} 3.4 \\ 3.3 \\ 3.4 \\ 3.5 \\ 3.4 \\ \hline 5\overline{)17.0} \\ \hline 3.4 \end{array}$$

**6.** Following a big snowstorm these measurements were made of the depth of the snow: 9.8 in., 9.7 in., 9.6 in., 9.7 in., 9.7 in. Find the average depth.

1. Study the numbers below. In *A* the 6 stands for \$.06. If you move the 6 one place to the left, you get *B* in which the 6 stands for \$.60. \$.60 is 10 times \$.06. This shows that when you move the 6 one place to the left, its value becomes 10 times as great.

*A*. In \$1000.06 the 6 stands for \$ .06
*B*. In \$1000.60 the 6 stands for \$ .60
*C*. In \$1006.00 the 6 stands for \$ 6.00
*D*. In \$1060.00 the 6 stands for \$ 60.00

Now look at *B* where the 6 stands for \$.60. If you move this 6 one place to the left, you get *C*. But in *C* the 6 stands for \$6.00. \$6.00 is 10 times \$.60. Again you see that the value of the 6 becomes 10 times as great by moving it one place to the left.

2. Show that the 6 in *D* is 10 times as great as the 6 in *C*.

> If any figure of a number is moved one place to the left, its value is multiplied by 10.

Tell the value of the figure 3 in each number:

| | | | | |
|---|---|---|---|---|
| 3. 1432.7 | 3517.5 | 4320.6 | 1763.1 | 2745.3 |
| 4. 143.27 | 351.75 | 432.06 | 176.31 | 274.53 |

5. The number 9 stands for 9 ones. If you wish to move the 9 one place to the left so that it stands for 90, you have to write a zero in ones place. The zero holds the ones place and pushes the 9 over to the tens place. In a case like this the zero is called a *place holder*.

6. Study these Roman numbers: V, VI, VII. The number V stands for 5. If you move this V one place to the left, as in VI, does its value become 10 times as great as before? Is the value of V in VII 10 times as great as it is in VI? Do Roman numbers have place value?



Multiplication Test 2a. Time: 5 min. after copying.

| | | | | | |
|---|---|---|---|---|---|
| 1. 483 | 429 | 761 | 409 | 617 | 385 |
| 294 | 367 | 548 | 429 | 307 | ⑥ 650 |

Multiplication Test 2b. Time: 5 min. after copying.

| | | | | | |
|---|---|---|---|---|---|
| 2. 617 | 583 | 679 | 249 | 238 | 457 |
| 169 | 378 | 209 | 583 | 467 | ⑥ 680 |

Multiplication Test 2c. Time: 5 min. after copying.

| | | | | | |
|---|---|---|---|---|---|
| 3. 709 | 691 | 817 | 428 | 635 | 523 |
| 974 | 506 | 832 | 195 | 537 | ⑥ 490 |

Division Test 2a. Time: 4 min. after copying.

| | | |
|---|---|---|
| 4. 51)3978 | 49)1823 | 67)1876 |
| 5. 39)1856 | 28)1797 | ⑥ 25)1950 |

Division Test 2b. Time: 4 min. after copying.

| | | |
|---|---|---|
| 6. 42)3066 | 38)1683 | 21)1449 |
| 7. 29)2668 | 23)1817 | ⑥ 89)5300 |

Division Test 2c. Time: 4 min. after copying.

| | | |
|---|---|---|
| 8. 33)2046 | 57)4240 | 39)1996 |
| 9. 41)3030 | 24)1416 | ⑥ 48)3072 |

Improvement Tests. In ex. 4–9, write R before remainders.

Some of the numbers below need decimal points to make the statements sensible; other numbers have decimal points that are in the wrong places. Tell where the decimal points should be placed to make the statements sensible:

1. Mr. Roberts paid $4.75 for an old car.
2. Today Mrs. Black drove her car 1800 mi. in 6 hr.
3. Alice practices on the violin 45 hr. every week.
4. Mr. Hill paid $90.00 for his new house.
5. Tom bought 2 movie tickets at $25 each.
6. Mr. Brown paid Bill $25 for working $\frac{1}{2}$ hr.
7. A fast train traveled 300 mi. in $\frac{1}{2}$ hr.
8. Ann's baby sister is 6 mo. old and weighs 150 lb.
9. The Christmas tree in our living room is 95 ft. tall.
10. The fat man in the circus weighs 32.5 lb.
11. Henry paid $6.50 for a necktie.
12. Mrs. Dean bought a chicken that weighed 45 lb.
13. Betty is 5.8 in. tall and weighs 695 lb.
14. In a severe storm 204 in. of rain fell in 1 hr.
15. On Saturday Frank rode his bicycle 115 mi.
16. Joe made a model airplane 33 ft. long.

1. By what number do you multiply both numerator and denominator of $\frac{3}{10}$ to change it to $\frac{30}{100}$? Does $\frac{3}{10} = \frac{30}{100}$? Does .3 = .30?

2. You see that .3 = .30. This means that .3 and .30 have the *same value*. When you changed .3 to .30, you changed the name of .3 from 3 *tenths* to 30 *hundredths* without changing the value of .3. The quick way to change .3 to .30 is to annex a zero at the right of .3. The quick way to change .30 back to .3, is to drop the zero of .30.

3. How do you change $\frac{23}{100}$ to $\frac{230}{1000}$? Does .23 = .230? When you change .23 to .230, you change the name of .23 from what to what? Do .23 and .230 have the same value? What is the quick way to change .23 to .230? What is the quick way to change .230 back to .23?

4. How do you change $\frac{7}{100}$ to $\frac{70}{1000}$? Does .07 = .070?
5. How do you change $\frac{40}{100}$ to $\frac{4}{10}$? Does .40 = .4?
6. How do you change $\frac{3}{10}$ to $\frac{300}{1000}$? Does .3 = .300?
7. Does .5 = .55? Does .5 = .50? Does .500 = .50?

> You can change the name of a decimal without changing its value by annexing or dropping zeros at the right of it.

8. Change to hundredths: .4 .8 .1 .9 .7 .3
9. Change to thousandths: .84 .60 .07 .75 .5 .3
10. Change to tenths: .70 .20 .900 .400 .60
11. Change to hundredths: .630 .800 .120 .060 .300

Change one decimal so that both decimals have the same name:

12. .7 and .28 .37 and .004 .43 and .4
13. .9 and .833 .08 and .091 .06 and .594

1. Yesterday there was a heavy rain storm that lasted only an hour. Before the storm Bill put a pan outdoors to catch the rain. When the storm was over the water in the pan was $\frac{1}{2}$ in. deep. Since $\frac{1}{2} = \frac{5}{10}$, Bill said ".5 in. of rain fell during the hour." The next day Bill read the Weather Report in the paper and found that .47 in. of rain had fallen during the hour. Bill wondered how much difference there was between the .5 in. he had measured and the .47 in. reported by the Weather Bureau. Which is more, .5 in. or .47 in.?

You cannot compare two numbers unless they have the same name. For example, you cannot compare 12 *cents* and 3 *nickels* because *cents* and *nickels* are different names; but if you change 3 *nickels* to 15 *cents*, you can then compare 12 *cents* and 15 *cents*. You see that 15 *cents* is more than 12 *cents*.

Likewise you cannot compare two decimals like .5 and .47 because they have different names; the name of .5 is *tenths* while the name of .47 is *hundredths*. But if you change .5 to .50, you can then compare .50 and .47 because both decimals now have the name *hundredths*. You see that .50 in. is a little more than .47 in., so Bill's measurement was a little more than the one reported by the Weather Bureau.

*To compare decimals with different names, first change them to decimals having the same name.*

In each pair of numbers, tell which number is larger:

| | | | |
|---|---|---|---|
| 2. .7 or .65 | .77 or .700 | .7 or .689 | 4.3 or 4.28 |
| 3. .9 or .93 | .25 or .249 | .5 or .531 | 2.1 or 2.07 |
| 4. .1 or .08 | .06 or .006 | .9 or .809 | 3.5 or 3.55 |
| 5. .7 or .69 | .03 or .030 | .4 or .499 | 2.0 or 1.99 |
| 6. .4 or .04 | .49 or .475 | .8 or .800 | 1.7 or 1.85 |

7. Change these decimals so they all have the same name. Then arrange them in order of size, beginning with the largest: .85 .9 .136 .4 .962 .97 .6 .37



When you write numbers that stand for dollars and cents, you are writing decimals. For example, \$6.37 is a mixed decimal which means $\$6\frac{37}{100}$.

1. John paid \$3.65 for a pair of skis, \$1.40 for a ski pole, \$2.00 for a wool cap, and \$1.38 for a pair of mittens. How much did he pay for all these things?

When you add the amounts as shown at *A*, be sure to keep the decimal points in a line under one another. Place a decimal point in the answer under the other decimal points.

| *A* |
|---|
| \$3.65 |
| 1.40 |
| 2.00 |
| 1.38 |
| \$8.43 |

2. Dick has a cyclometer on his bicycle that tells how far he rides. The cyclometer gives the distances to *tenths* of a mile. On Monday he rode 11.4 mi., on Tuesday he rode 9.7 mi., and on Wednesday he rode 12.3 mi. How many miles in all did he ride in the 3 days?

3. Add these numbers: 3.125 + 4.76 + 6.3 + 2.489.

Sometimes you will find an example in decimals like the one above where the numbers do not each have the same number of decimal places. Such examples are usually impractical. You can add these numbers, however, if you are careful to keep the decimal points under one another as shown at *B* and if you keep the decimals in their proper columns so that 1, 7, 3, and 4 are in the *tenths* column, 2, 6, and 8 are in the *hundredths* column, and 5 and 9 are in the *thousandths* column. It is much easier to add these numbers, however, if you annex zeros at the end of 4.76 and 6.3 as shown at *C* so that all the decimals will have the same number of places. This example would have been more practical if, at first, all the decimals had been written with three decimal places as shown at *C*.

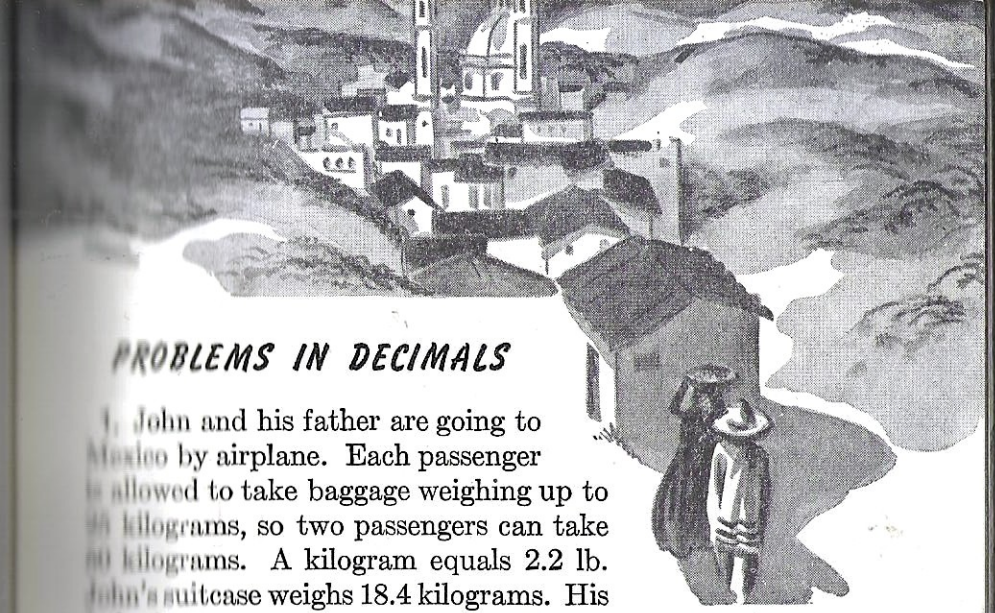
| *B* | *C* |
|---|---|
| 3.125 | 3.125 |
| 4.76 | 4.760 |
| 6.3 | 6.300 |
| 2.489 | 2.489 |

Add. Check the work by going over it:

| | | | | | | |
|---|---|---|---|---|---|---|
| 1. | 1.25 | 13.4 | 6.75 | 7.33 | 2.750 | 9.833 |
| | .53 | 11.2 | 9.88 | 1.67 | 1.375 | 4.251 |
| | .75 | 9.4 | 4.37 | 8.51 | 4.533 | 6.167 |
| | 2.86 | 1.5 | 6.75 | 4.97 | 2.875 | 7.599 |
| 2. | 44.7 | 3.27 | 7.84 | 5.66 | 5.282 | 6.003 |
| | 19.5 | 1.19 | 4.24 | 2.17 | .169 | 8.141 |
| | 18.3 | .54 | 9.36 | 7.19 | .724 | 3.228 |
| | 27.2 | 8.61 | 7.79 | .75 | 6.123 | .953 |
| | 53.6 | 2.97 | 6.15 | 1.18 | 9.047 | 4.318 |
| | 19.9 | 4.38 | 2.81 | 4.67 | 8.203 | 5.225 |
| 3. | 18.2 | 5.46 | 3.15 | 8.59 | 1.444 | 3.075 |
| | 47.3 | 1.35 | 9.22 | .64 | 2.639 | .675 |
| | 15.9 | 9.07 | .77 | .50 | .863 | 2.163 |
| | 2.7 | .48 | 2.48 | 4.88 | 4.217 | .015 |
| | 31.6 | .26 | .95 | 9.20 | .826 | 8.372 |
| | 16.8 | 4.13 | 6.24 | 1.67 | 9.249 | 4.998 |

Find the sums. First copy in columns, annexing zeros when necessary to give each decimal the same number of places:

4. 23.1 + 16 + 32.7 + 8.6 + 19.4 + 12
5. 2.166 + 3.75 + 4.8 + 2.5 + 6.375 + 9.125
6. 5.875 + 1.333 + 2.75 + 8.5 + 1.625 + 4.25
7. 6.25 + 9.666 + 7.5 + 5.75 + 8.125 + 4.167
8. 6 + 3.5 + 2.775 + 4.125 + 6.25 + 15
9. 3.67 + 2.333 + 7.75 + 19 + 1.375 + 12.5
10. 15.4 + 9.25 + .625 + 6.5 + 19.75 + 11.125
11. 1.4 + 13.75 + 9.5 + 4.375 + 1.875 + 16.5
12. 8.62 + 11.47 + 9.25 + 6.84 + 15.08 + 2.36
13. 7.375 + 8.75 + 4.5 + .875 + 9 + 6.25 + 11.5
14. 14.6 + 10.8 + 19.6 + 13.3 + 11.5 + 12.7 + 10.5



## PROBLEMS IN DECIMALS

1. John and his father are going to Mexico by airplane. Each passenger is allowed to take baggage weighing up to 25 kilograms, so two passengers can take 50 kilograms. A kilogram equals 2.2 lb. John's suitcase weighs 18.4 kilograms. His father's suitcase weighs 29.7 kilograms. Is this baggage light enough?

2. It is 35.4 mi. from Weston to Middleville, 14.7 mi. from Middleville to Bayport, and 29.5 mi. from Bayport back to Weston. How many miles is the trip from Weston to Middleville, Bayport, and back to Weston?

3. The scales the school nurse uses to weigh the pupils weigh to tenths of a pound. Jack weighs 79.4 lb., Tom weighs 76.2 lb., George weighs 83.5 lb., and Bill weighs 80.9 lb. What is the average weight of these boys?

4. John lives where there are heavy snowfalls from November through March. Last winter the snowfall was 25.2 in. for November, 5.3 in. for December, 28.1 in. for January, 24.0 in. for February, and 13.8 in. for March. How many inches of snow fell in those five months?

5. One year in Juneau, Alaska, there were these amounts of rainfall: Jan., 4.86 in.; Feb., 2.40 in.; Mar., 7.74 in.; Apr., 7.18 in.; May, 5.59 in.; June, .54 in.; July, 6.48 in.; Aug., 2.76 in.; Sept., 12.34 in.; Oct., 18.71 in.; Nov., 25.87 in.; Dec., 9.11 in. Find the total rainfall that year.

1. In the morning when Mr. Brown left home the speedometer on his car read 917.8 mi. In the evening when he returned home it read 968.3 mi. How many miles did he drive that day?

You subtract these decimals just as you subtract dollars and cents. Put the decimal point in the answer under the decimal points above. To check the work add 50.5 to 917.8, and see if the sum equals 968.3.

```
968.3
917.8
 50.5
```

2. The timetable at the right shows how many miles each station is from New York.

How many miles is it from New York to Baltimore? from Baltimore to Washington? from Washington to Greensboro? from Greensboro to Raleigh? from Washington to Raleigh?

| Miles | Station | P.M. |
|---|---|---|
| 0.0 | New York | 6:25 |
| 186.5 | Baltimore | 9:37 |
| 226.6 | Washington | 10:25 |
| 510.6 | Greensboro | 6:05 |
| 591.8 | Raleigh | 10:05 |

3. The water in a swimming pool is 7.3 ft. deep at one end of the pool and 3.5 ft. deep at the other end. How much deeper is the water at one end than at the other?

4. Alice rode her bicycle 6.2 mi. yesterday and 5.5 mi. today. How much farther did she ride yesterday than today?

5. Peter ran the 100-yard dash in 16.2 sec. and Henry ran it in 14.8 sec. How many seconds less time did Henry take than Peter?

6. John has saved $5. If he buys a pair of skates for $1.75, how much will he have left?

You could write the numbers as at *A* but it is easier if you write a decimal point and two zeros after $5 as shown at *B*.

| *A* | *B* |
|---|---|
| $5 | $5.00 |
| 1.75 | 1.75 |

7. Mr. Bates started on a 100-mile trip in his car. He drove 46.5 mi. before lunch. How many miles did he still have to drive after lunch?



Subtract and check the work:

| | | | | |
|---|---|---|---|---|
| 1. 26.7 | 47.2 | 1.288 | 6.375 | $2387.92 |
| 19.3 | 29.6 | .374 | 4.125 | 729.53 |
| 2. 10.8 | 36.1 | 4.327 | 5.333 | $6280.50 |
| 9.9 | 23.7 | 2.068 | 1.667 | 2255.75 |
| 3. 52.6 | 43.4 | 7.253 | 9.208 | $4500.00 |
| 25.5 | 36.8 | 4.125 | .774 | 1865.35 |
| 4. 6.29 | 3.19 | 6.119 | 5.725 | $3000.00 |
| 4.33 | 2.83 | 2.066 | 3.167 | 2166.58 |
| 5. 8.50 | 9.28 | 4.375 | 6.025 | $9255.75 |
| 4.06 | 3.79 | .875 | 3.116 | 3809.00 |
| 6. 10.8 | 15.0 | 6.125 | 9.750 | 284.756 |
| 5.9 | 4.7 | 3.520 | 4.375 | 175.875 |

Copy in columns and subtract. Annex zeros as necessary to give each decimal the same number of places:

| | | |
|---|---|---|
| 7. 18.2 − 13.6 | 1.96 − .38 | $285 − $197.50 |
| 8. 42.8 − 37.4 | 5.82 − 4.7 | $400 − $238.93 |
| 9. 29.0 − 16.5 | 9.16 − .39 | $650 − $299.38 |
| 10. 4.25 − .375 | 12.8 − .75 | $500 − $375.25 |
| 11. 16.5 − 2.38 | 40.0 − .33 | $172 − $104.60 |
| 12. 92.6 − 7.33 | 8.15 − 6.4 | $209 − $186.64 |
| 13. 1.08 − .465 | 20.0 − .95 | $530 − $429.87 |
| 14. 528 − 47.9 | .875 − .25 | $985 − $775.36 |
| 15. 4.75 − .875 | 1.25 − .75 | $200 − $146.77 |
| 16. 10.4 − 2.33 | 16.0 − .93 | $183 − $109.25 |

1. Tom has \$.75. He says he has 3 quarters of a dollar. Show that Tom is right.

You must show that $.75 = \frac{3}{4}$. You know that $.75 = \frac{75}{100}$. Reduce $\frac{75}{100}$ to lowest terms. What is the largest number that will divide both 75 and 100? If you divide both 75 and 100 by 25, does $\frac{75}{100}$ reduce to $\frac{3}{4}$? Does $.75 = \frac{3}{4}$?

2. Change .25 to a fraction. Change .50 to a fraction.

Change these decimals to fractions:

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 3. | .85 | .60 | .40 | .35 | .15 | .55 | .80 |
| 4. | .32 | .64 | .16 | .20 | .48 | .36 | .72 |
| 5. | .45 | .70 | .95 | .78 | .42 | .68 | .56 |

6. Remember these decimals and their fractional values:

$.25 = \frac{1}{4}$ $\quad$ $.50 = \frac{1}{2}$ $\quad$ $.75 = \frac{3}{4}$

7. Change .375 to a fraction.

You know that $.375 = \frac{375}{1000}$. To reduce $\frac{375}{1000}$ to lowest terms, make use of the tests of divisibility on page 101. You see that 5 will divide both 375 and 1000. Dividing both terms of $\frac{375}{1000}$ by 5, you get $\frac{75}{200}$. You can then reduce $\frac{75}{200}$ by dividing both terms by 5, which gives $\frac{15}{40}$. Reducing $\frac{15}{40}$, you get $\frac{3}{8}$. So $.375 = \frac{3}{8}$. $\frac{375}{1000}$ was reduced to lowest terms in several steps as follows:

$$\frac{375}{1000} = \frac{75}{200} = \frac{15}{40} = \frac{3}{8}$$

8. In ex. 7, you could have reduced $\frac{375}{1000}$ to $\frac{3}{8}$ in fewer steps by dividing both 375 and 1000 by some number larger than 5. What number would that be? Reduce $\frac{375}{1000}$ to $\frac{3}{8}$ this new way.

Change these decimals to fractions:

| | | | | | | |
|---|---|---|---|---|---|---|
| 9. | .125 | .625 | .875 | .650 | .350 | .225 |
| 10. | .275 | .150 | .425 | .850 | .525 | .175 |



1. At a remnant sale Mary paid \$2.31 for a piece of cloth 10 yd. long. How much per yard did the cloth cost?

$$\begin{array}{r} \$\ .23\tfrac{1}{10} \\ 10\overline{)\$2.31} \\ \underline{20} \\ 31 \\ \underline{30} \\ 1 \end{array}$$

You see that the cloth cost $\$.23\frac{1}{10}$ per yard. $\$.23\frac{1}{10}$ may also be written as $23\frac{1}{10}¢$. The $\frac{1}{10}$ in $23\frac{1}{10}¢$ means $\frac{1}{10}$ of a cent.

2. Tom says that another way to write $\$.23\frac{1}{10}$ is \$.231. He says that the 1 in \$.231 equals $\frac{1}{10}$ of a cent. Tom says that it is easy to prove that this is so. This is how he does it:

The 1 in \$.231 means \$.001 which equals $\frac{1}{1000}$ of a dollar. $\frac{1}{10}$ of a cent also equals $\frac{1}{1000}$ of a dollar because a cent equals $\frac{1}{100}$ of a dollar and $\frac{1}{10}$ of $\frac{1}{100}$ equals $\frac{1}{1000}$. So \$.001 equals $\frac{1}{10}$ of a cent. This shows that $\$.23\frac{1}{10}$ equals \$.231.

Write $\$.42\frac{1}{10}$ another way without using the fraction $\frac{1}{10}$.

*In writing dollars and cents, a figure in thousandths place represents tenths of a cent.*

3. Other money numbers containing *tenths* of a cent may be written as explained above. Study these examples:

$\$.12\frac{3}{10}$ may be written as \$.123.
$\$.68\frac{7}{10}$ may be written as \$.687.
$\$.59\frac{4}{10}$ may be written as \$.594.
$\$.37\frac{5}{10}$, or $\$.37\frac{1}{2}$, may be written as \$.375.

A number like $\$.12\frac{1}{2}$ must first be thought of as $\$.12\frac{5}{10}$ before it can be written as \$.125.

4. Write each of these another way: $\$.14\frac{3}{10}$, $\$.22\frac{5}{10}$, $\$.38\frac{9}{10}$, $\$.26\frac{1}{2}$, $\$.06\frac{4}{10}$, $\$1.27\frac{1}{2}$.

5. Write each, expressing tenths of a cent in fractional form: \$.148, \$.273, \$.865, \$.461, \$.555, \$.632, \$.938.

6. Write each in two other ways: \$1.265, \$.025, \$.875, \$.625, \$.629, \$.043, \$4.172; $53\frac{1}{2}¢$.

1. A large restaurant serves an average of 4785 meals per day. How many meals do they serve in 365 da.?

2. The restaurant in ex. 1 serves an average of 1015 breakfasts a day. How many breakfasts do they serve in a month of 30 da.?

3. Our school lunchroom serves an average of 1270 lunches per day. How many lunches does it serve in 175 days?

4. Find the mistakes, if any, in these examples. Then correct the mistakes. Watch the zeros:

| | | | |
|---|---|---|---|
| 5864 | 9002 | 4619 | 2780 |
| 725 | 806 | 940 | 630 |
| 29320 | 54012 | 184760 | 83400 |
| 11728 | 72016 | 40571 | 16680 |
| 41048 | 774172 | 4241860 | 240200 |
| 4251400 | | | |

Multiply. Check by going over the work:

| | | | | |
|---|---|---|---|---|
| 5. 1205 | 5768 | 4790 | 8019 | 3027 |
| 806 | 571 | 934 | 362 | 780 |
| 6. 6184 | 2469 | 4007 | 1578 | 6235 |
| 359 | 178 | 786 | 407 | 940 |
| 7. 3920 | 7368 | 3572 | 2907 | 9342 |
| 852 | 608 | 432 | 195 | 670 |
| 8. 5236 | 4513 | 8150 | 6189 | 8197 |
| 293 | 549 | 862 | 354 | 200 |
| 9. 9361 | 6924 | 3742 | 4705 | 5678 |
| 417 | 862 | 456 | 631 | 450 |
| 10. 1407 | 2358 | 1675 | 5219 | 7042 |
| 568 | 246 | 693 | 387 | 720 |



1. Find the sum of the first row: 16 + 22 + 3 + 9 + 10. Find the sum of the first column: 16 + 23 + 0 + 7 + 14. Then find the sum of one diagonal: 16 + 4 + 12 + 20 + 8. Find the sum of each of the other rows, columns, and the other diagonal. Are the 12 sums all alike? If so, this is a *magic square*.

| | | | | |
|---|---|---|---|---|
| 16 | 22 | 3 | 9 | 10 |
| 23 | 4 | 5 | 11 | 17 |
| 0 | 6 | 12 | 18 | 24 |
| 7 | 13 | 19 | 20 | 1 |
| 14 | 15 | 21 | 2 | 8 |

Test the two squares below. Are they magic squares?

2.

| | | | | |
|---|---|---|---|---|
| 1 | 20 | 9 | 23 | 12 |
| 18 | 7 | 21 | 15 | 4 |
| 10 | 24 | 13 | 2 | 16 |
| 22 | 11 | 5 | 19 | 8 |
| 14 | 3 | 17 | 6 | 25 |

3.

| | | | | |
|---|---|---|---|---|
| 4 | 23 | 17 | 11 | 10 |
| 12 | 6 | 5 | 24 | 18 |
| 25 | 19 | 13 | 7 | 1 |
| 8 | 2 | 21 | 20 | 14 |
| 16 | 15 | 9 | 3 | 22 |

Put the missing numbers in these squares to make them magic squares. First find what the sum should be. Test the final squares:

4.

| | | | | |
|---|---|---|---|---|
| 63 | 52 | 66 | 55 | 74 |
| 71 | | 54 | 68 | 57 |
| | 73 | 62 | 51 | |
| 67 | 56 | 70 | | 53 |
| 50 | 69 | | 72 | 61 |

5.

| | | | | |
|---|---|---|---|---|
| 23 | | 2 | 20 | |
| 22 | 16 | 9 | 14 | |
| 5 | 11 | 13 | 15 | 21 |
| | 12 | | 10 | 18 |
| 7 | 25 | | 6 | 3 |

1. Traveling at the rate of 160 mi. an hour, how far can an airplane fly in 9 hr.?

2. In a test flight an airplane flew to a height of 44,940 ft. Is that about 8 mi. high or about $8\frac{1}{2}$ mi. high?

3. At 30¢ an hour, how much should Kate receive for taking care of some children for 4 hr. 30 min.?

4. A sea mile, or nautical mile, is 6080.20 ft. long. How many feet longer is a sea mile than a land mile?

5. What is the perimeter of a rectangular lot 96.8 ft. long and 51.7 ft. wide?

6. During a heavy rain storm 1.85 in. of rain fell in the first hour and 2.09 in. fell in the second hour. How much more rain fell the second hour than the first hour?

7. Which has the larger area, a rectangle 10 ft. by 14 ft. 6 in. or a square 12 ft. on a side? how much larger?

8. In ex. 7, which has the larger perimeter, the rectangle or the square? how much larger?

9. Mrs. Brown bought $5\frac{1}{2}$ lb. of oranges at 12¢ a pound, $\frac{3}{4}$ lb. of beans at 19¢ a pound, and 2 bunches of beets for 15¢. How much was her bill?

10. In cooking a roast Mrs. White allows 30 min. for each pound. How long must she cook a $6\frac{1}{2}$-pound roast?

11. Jack bought a pair of skates that were marked $4.00. He got them for $\frac{1}{5}$ less than they were marked. How much did he pay for the skates?

12. John is drawing a map on a scale of $\frac{1}{8}$ in. = 50 mi. On this map how far apart should he put two towns that are actually 450 mi. apart? How far apart should he put two towns that are actually 625 mi. apart?

13. George gathered 432 eggs last week and sold them at $.35 a dozen. How much money did he get?



Addition Test 3a. Time: 4 min.

| | | | | |
|---|---|---|---|---|
| 1. $15.58 | $23.94 | $14.79 | $22.53 | $44.91 |
| 7.63 | 34.57 | 39.50 | 7.65 | 8.69 |
| 23.45 | 16.86 | 47.97 | 16.96 | 4.76 |
| 11.84 | 2.33 | 98.68 | 5.27 | 51.98 |
| 1.32 | 10.49 | 20.08 | 11.32 | ⑤ 22.16 |

Addition Test 3b. Time: 4 min.

| | | | | |
|---|---|---|---|---|
| 2. $25.47 | $23.04 | $50.31 | $36.22 | $ 5.94 |
| 7.75 | 35.68 | 5.76 | 1.91 | 22.03 |
| 19.69 | 6.76 | 29.48 | 18.77 | 8.65 |
| 1.82 | 11.29 | 3.53 | 7.44 | 14.88 |
| 13.02 | 2.52 | 13.37 | 4.69 | ⑤ 61.76 |

Addition Test 3c. Time: 4 min.

| | | | | |
|---|---|---|---|---|
| 3. $62.81 | $26.89 | $33.53 | $18.93 | $59.14 |
| 49.44 | 8.76 | 7.84 | 32.54 | 8.25 |
| 7.63 | 9.57 | 51.77 | 5.75 | 11.62 |
| 4.85 | 13.65 | 9.96 | 7.96 | 9.27 |
| 33.39 | 3.62 | 15.15 | 10.32 | ⑤ 22.76 |

Improvement Tests.

## THE LANGUAGE OF ARITHMETIC

Show that you know what each word or phrase means by using it in a sentence or by giving an illustration of it:

| | | |
|---|---|---|
| 4. numerator | 10. divisible | 16. bar graph |
| 5. reduction | 11. denominator | 17. less than |
| 6. multiplier | 12. difference | 18. round number |
| 7. rectangle | 13. dividend | 19. square yard |
| 8. thousand | 14. remainder | 20. nearest million |
| 9. estimate | 15. gallon | 21. scale drawing |

1. On a trip across the country an airplane is flying at a speed of $5\frac{1}{2}$ mi. per minute. How far can it travel in 1 hr. at this rate? in $2\frac{1}{2}$ hr.?

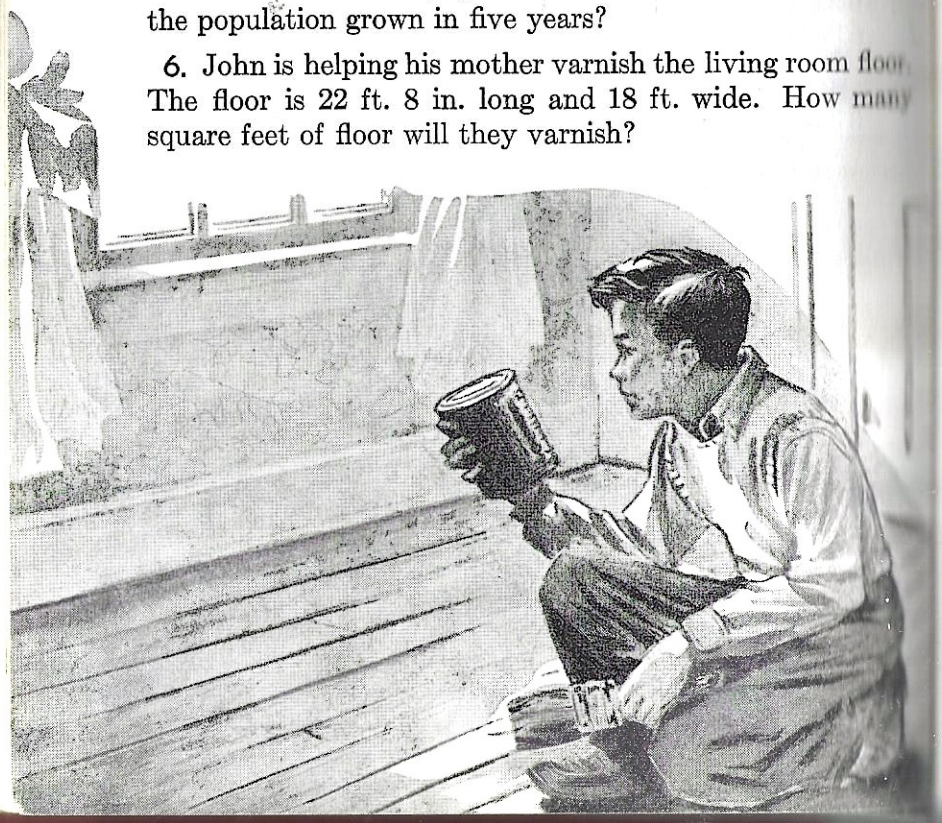
2. Jack bought a pair of skates for \$5.65, a skate strap for \$.25, and sport socks for \$.79. How much change did he get from \$10.00?

3. Mr. Brown finds that he can drive his car an average of 18 mi. per gallon of gasoline. The tank on his car holds 15 gal. How many miles can Mr. Brown travel when the tank is full of gasoline?

4. On 4 days Mr. Hill drove these distances: 245 mi., 298 mi., 276 mi., 198 mi. What was the average number of miles he drove per day?

5. The town in which Bill lives had a population of 8550 in 1940. In 1945 the population was 9000. How much had the population grown in five years?

6. John is helping his mother varnish the living room floor. The floor is 22 ft. 8 in. long and 18 ft. wide. How many square feet of floor will they varnish?





In each problem a fact is missing which you must know before you can find the answer. Supply the missing fact and work the problem:

1. Helen began practicing on the piano at 4:15 P.M. How long did Helen practice?

2. Alice takes care of young children in the afternoon. At \$.35 an hour, how much did she earn yesterday?

3. At an average of 40 mi. an hour, how many hours will it take a train to go from Westfield to Newtown?

4. The speedometer of our car read 7284.6 mi. when we left home this morning. We came back this evening. How far did we drive today?

5. At an average speed of 165 mi. per hour, how many miles will an airplane fly?

6. Bill bought a tie, a cap, and a belt. How much change did he get from \$3.00?

7. In the store bananas are sold at 12¢ a pound. How much did the bananas cost that Mary bought today?

8. A pilot flew 1287 mi. from Miami, Florida, to New York. What was his speed per hour?

9. Jane had \$1.35 left after she bought a dress. How much did the dress cost?

10. Mary can save \$.20 a week. How many weeks will it take her to save enough to buy a book that she wants?

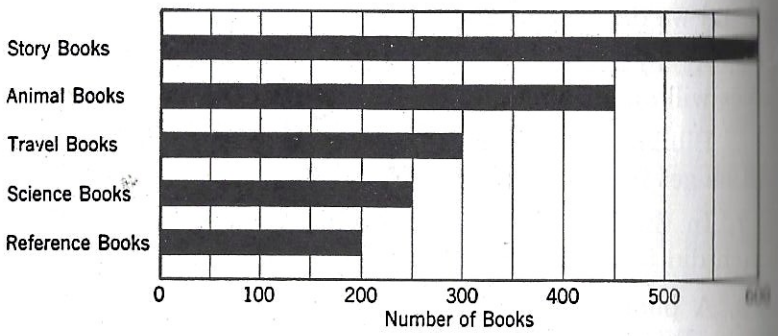
11. Fred bought some handkerchiefs for \$1.50. At that rate, what was the cost of 1 handkerchief?

12. George and his father went fishing and each caught a fish. The fish that George caught weighed $4\frac{1}{2}$ lb. How much more did it weigh than the one his father caught?

13. The boys and girls in Lincoln School sold tickets for the school play. The girls sold 215 tickets. How many tickets did the boys sell?

1. When a number like 291 is *rounded off* to the nearest 50, it becomes 300 because 291 is closer to 300 than it is to 250. If the number 342 is rounded off to the nearest 50, it becomes 350 because 342 is closer to 350 than to 300. Likewise 417, if rounded off to the nearest 50, becomes 400. Tell what each of these numbers will become if rounded off to the nearest 50: 357 288 411 695 120.

2. The graph below shows how many books of each of 5 kinds there are in the school library. Read the graph and tell about how many books of each kind there are.




3. The actual number of books of each kind in the school library is as follows: 593 story books, 448 animal books, 312 travel books, 259 science books, 189 reference books. Round off each of these numbers to the nearest 50. Then see if each bar in the above graph is the right length.

4. Draw a bar graph like the one above showing the number of pupils in each of these schools: Knox, 477; Lincoln, 605; Longfellow, 793; Washington, 562. Before drawing the graph, round off each number to the nearest 50.

5. Draw a bar graph like the one above showing the number of stamps each boy has: Bob, 458; Fred, 493; Joe, 560; Tom, 588; Jack, 642; Bill, 690; George, 764. Before drawing the graph, round off each number to the nearest 50.



1. Jack is buying Christmas presents. Today he bought 3 neckties at $.65 each. How much did they cost?

When you multiply $.65 by 3, you are multiplying a decimal by a whole number. You place the decimal point before the last two figures of the product to separate the dollars from the cents. Notice that the product $1.95 has the same number of decimal places as the multiplicand $.65. Jack paid $1.95 for the neckties.

$ .65
3
$1.95

2. Bill lives 1.4 mi. from the post office. How far does he walk going to the post office and back?

When you multiply a decimal like 1.4 by a whole number, the product must have the same number of decimal places as the decimal itself. Since 1.4 has one decimal place, the product must have one decimal place. So place the decimal point before the 8 of 28. The answer is 2.8.

1.4
2
2.8

It is easy to show that 2.8 is the right answer. When you multiply 1.4 by 2, it is the same as adding 1.4 to 1.4. What is the sum of 1.4 and 1.4? Bill walks 2.8 mi. to the post office and back.

3. Study these examples:

| | | | | |
|---|---|---|---|---|
| .9 | .38 | .09 | .028 | .009 |
| 4 | 5 | 3 | 6 | 6 |
| 3.6 | 1.90 | .27 | .228 | .054 |

In each example above, which number is the multiplicand? the product? In each example does the product have the same number of decimal places as the multiplicand?

In the first example above show that 7.8 is the right answer by adding these numbers: 2.6 + 2.6 + 2.6.

> To multiply a decimal by a whole number, multiply as with whole numbers. Then, beginning at the right, point off as many decimal places in the product as there are decimal places in the multiplicand.

1. The *knot* is a unit for measuring the speed of a boat or a ship. *A speed of 1 knot is equal to a speed of 1.15 mi. per hour.* If a ship travels at an average speed of 12 knots, what is its speed in miles per hour?

It is incorrect to speak of the speed of a boat as 12 knots *per hour*; it is sufficient to say that the speed of the boat is 12 knots. When the word *knot* is used, it refers to the speed *per hour*.

2. What is the speed in miles per hour of a ship that travels at a speed of 18 knots?

3. On a trip across the Atlantic Ocean the *Queen Mary* had an average speed of 29 knots. What was her speed in miles per hour?

4. In 1935, Sir Malcolm Campbell averaged 4.65 mi. per minute in a specially built car. At that rate, how far would he go in 6 min.?

5. A sheet of paper is .015 in. thick. How thick are 25 such sheets placed together in a pile?

6. Mr. Hill finds that on the average he can drive his car 17.5 mi. on each gallon of gasoline. If his gasoline tank holds 15 gal., how far can he travel on a tank full of gasoline?

Multiply. Check the work by going over it:

| | | | | | |
|---|---|---|---|---|---|
| 7. 34.6 | 27.9 | 4.63 | 7.29 | .634 | .008 |
| 8 | 5 | 9 | 4 | 7 | 6 |
| 8. 82.9 | .007 | 7.19 | .287 | .089 | .100 |
| 3 | 6 | 2 | 8 | 9 | 7 |
| 9. 3.68 | 56.8 | .217 | 4.05 | .147 | .341 |
| 64 | 35 | 91 | 48 | 23 | 59 |
| 10. .058 | 7.85 | 1.09 | .623 | .049 | .275 |
| 19 | 27 | 86 | 72 | 53 | 64 |



1. On long trips Mr. Brown drives his car at an average of 31.5 mi. an hour. How far can he drive in 3.1 hr.?

Multiply 31.5 by 3.1 as you multiply whole numbers. The product is 9765. To find where to put the decimal point, make a rough estimate of the answer by multiplying the 31 of 31.5 by the 3 of 3.1. This gives 93. Since the answer should be a little more than 93, the decimal point should be placed after 97 in the product, which gives 97.65. Mr. Brown drove 97.65 mi. in 3.1 hr.

```
 31.5
  3.1
 3 15
94 5
97.65
```

2. Another way to do ex. 1 is to change 31.5 to $31\frac{1}{2}$ and 3.1 to $3\frac{1}{10}$. Then multiply these numbers as shown below.

$$3\tfrac{1}{10} \times 31\tfrac{1}{2} = \tfrac{31}{10} \times \tfrac{63}{2} = \tfrac{1953}{20} = 97\tfrac{13}{20}$$

The answer is $97\frac{13}{20}$, which is the same as 97.65 because $\frac{13}{20} = \frac{65}{100}$. This shows that the answer in ex. 1 is correct.

3. There is a rule for finding the position of the decimal point in the product. Since there is 1 decimal place in 31.5 and 1 decimal place in 3.1, there are 2 decimal places in 31.5 and 3.1 together. The product should then have 2 decimal places in it. Beginning at the right, point off 2 decimal places in 9765, which gives 97.65 as the answer.

Estimate the answers roughly. Then multiply the numbers:

| | | |
|---|---|---|
| 4. 6.5 × 30.3 | 2.2 × 41.5 | 4.1 × 8.15 |
| 5. 1.2 × 9.36 | 7.1 × 90.3 | 5.3 × 9.04 |

> To multiply decimals, multiply as with whole numbers. Then, beginning at the right, point off as many decimal places in the product as there are decimal places in the multiplier and the multiplicand together.

1. Study these examples. Use the rule on page 141 to see if the decimal point in each product is correctly placed:

| | | | | |
|---|---|---|---|---|
| 7.3 | 1.38 | 2.8 | .67 | .78 |
| 2.6 | 4.2 | .3 | .4 | 1.5 |
| 4 38 | 276 | .84 | .268 | 390 |
| 14 6 | 5 52 | | | 78 |
| 18.98 | 5.796 | | | 1.170 |

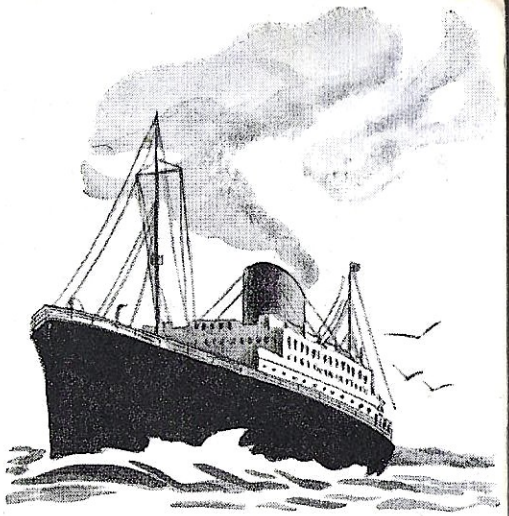
2. If you multiply 42 by 2.1, you get 882. Without using the rule, how do you tell which of these answers is correct? 8.82, 88.2, .882.

3. Without using the rule, tell whether 3.1 × 25.2 equals 781.2 or 7.812 or 78.12.

Multiply. Check by going over the work.

| | | | | | |
|---|---|---|---|---|---|
| 4. 4.7 | 6.3 | 91 | 5.8 | 1.27 | 24.6 |
| .18 | 2.9 | .7 | .4 | 2.6 | .15 |
| 5. .98 | .56 | 8.9 | 4.3 | 276 | 3.12 |
| 6.9 | .8 | 2.5 | .7 | 4.7 | 3.5 |
| 6. 65 | 40 | .24 | .67 | 80.9 | 39.4 |
| .6 | .25 | .9 | 3.5 | 8.3 | .64 |
| 7. 9.2 | 85 | 4.5 | 75 | 1.58 | 571 |
| 6.2 | .7 | .3 | .56 | 3.1 | .29 |
| 8. .13 | 3.7 | .48 | 9.3 | 5.98 | 46.5 |
| .5 | .34 | .8 | 7.1 | 5.2 | 7.6 |
| 9. 4.3 | 6.8 | 2.3 | .31 | 12.3 | 5.76 |
| 1.9 | .4 | 5.5 | .6 | .98 | 1.5 |
| 10. 3.8 | .57 | 64 | 8.4 | 1.74 | 396 |
| 2.1 | .9 | .5 | .96 | 1.2 | .63 |

## PROBLEMS



1. When you travel on land, distances are measured in *miles*, which are sometimes called *land miles*. When you travel on the ocean, distances are measured in *sea miles*. A sea mile is longer than a land mile. 1 sea mile = 1.15 land miles. If you take an ocean voyage of 2250 sea miles, how many land miles does that equal?

2. The rule on page 141 states that the product must have as many decimal places as there are places in the multiplicand and the multiplier together. Does this rule apply to the example at the right? How many decimal places are there in 41.5? How many decimal places are there in 3? How many decimal places are there in 41.5 and 3 together? Then how many decimal places should there be in the answer?

| |
|---|
| 41.5 |
| 3 |
| 124.5 |

3. The speedometer of Mr. Peck's car shows that the trip from his house to his camp is 16.7 mi. How many miles does he drive if he makes that trip 45 times during the summer?

4. Mr. Peck finds he can drive 17.4 mi. on a gallon of gasoline. How far can he drive on 8.5 gal. of gasoline? Find the cost of 8.5 gal. of gasoline at $.22 a gallon.

5. If .78 of the weight of a potato is water, how many pounds of water are there in 5 lb. of potatoes? in 8 lb.?

6. The average monthly rainfall for Easton last year was 4.58 in. How many inches of rain fell during the year?

7. Mr. Black earns $5.50 a day. How much does he earn in 5.5 days?

8. You can write $5.50 as $5\frac{1}{2}$ and 5.5 days as $5\frac{1}{2}$ days. Using these mixed numbers find the amount Mr. Black earns. Is your answer equal to the answer in ex. 7?

1. Multiply .12 by .7.

When small decimals are multiplied together it is sometimes difficult to place the decimal point correctly. In the work at the right you know that $7 \times 12 = 84$. If you follow the rule on page 141, you know that there should be 3 decimal places in the product, counting from the right. Since the third figure is missing, 0 is written before 84 so that there will be 3 decimal places in the product. This gives .084 as the answer.

$$\begin{array}{r} .12 \\ .7 \\ \hline .084 \end{array}$$

2. Another way to do ex. 1 is to write .7 as $\frac{7}{10}$ and .12 as $\frac{12}{100}$. Then multiply the fractions together. The result is $\frac{84}{1000}$, which equals .084 when written as a decimal. This shows that the answer in ex. 1 is correct.

$$\frac{7}{10} \times \frac{12}{100} = \frac{84}{1000}$$

3. Multiply .03 by .3 using the rule as was done in ex. 1. Then multiply these decimals by changing them first to fractions, as in ex. 2. Do you get the same answer either way?

> When the number of decimal places to be pointed off is greater than the number of figures in the product, put as many zeros to the left of the product as are needed to point off correctly.

Multiply these numbers:

| | | | |
|---|---|---|---|
| 4. $.6 \times .01$ | $.4 \times 2.2$ | $.03 \times 1.1$ | $.08 \times 3.1$ |
| 5. $.9 \times .11$ | $3 \times .06$ | $1.4 \times .06$ | $.12 \times .5$ |
| 6. $.4 \times .16$ | $2 \times .017$ | $.18 \times 1.6$ | $4.1 \times .02$ |
| 7. $.7 \times .05$ | $4 \times .025$ | $.08 \times .8$ | $0.2 \times .02$ |
| 8. $.3 \times .08$ | $7 \times .121$ | $1.8 \times .03$ | $.06 \times 1.4$ |
| 9. $.8 \times .07$ | $9 \times .014$ | $.15 \times 1.1$ | $4.3 \times .01$ |
| 10. $.5 \times .13$ | $6 \times .038$ | $.02 \times 3.2$ | $.17 \times 1.8$ |



In ex. 1 to 4 the product is given for each example but the decimal point has been omitted. Tell where the decimal point belongs in each product, inserting 0's if necessary. Give the answers orally like this: "Five-point-six":

| | | | | | |
|---|---|---|---|---|---|
| 1. | 4.8 | .09 | 3.8 | 5.28 | 13.5 |
| | .4 | .3 | 2.4 | 1.2 | 4.7 |
| | 192 | 27 | 912 | 6336 | 6345 |
| 2. | 1.9 | 17 | .06 | .037 | .59 |
| | .19 | .06 | .4 | 5 | 30 |
| | 361 | 102 | 24 | 185 | 1770 |
| 3. | 9 | .26 | .12 | 200 | .019 |
| | .07 | 2.5 | .5 | .38 | 5 |
| | 63 | 650 | 60 | 7600 | 95 |
| 4. | .16 | .82 | 6.4 | 24.6 | .30 |
| | 1.4 | .3 | .15 | .07 | 70 |
| | 224 | 246 | 960 | 1722 | 2100 |

In ex. 5 to 12, three answers are given for each example but only one answer is correct. Tell which is the right answer:

5. Does $7 \times 1.28$ equal 896 or 89.6 or 8.96?
6. Does $8 \times .999$ equal 7.992 or 799.2 or 79.92?
7. Does $5 \times 26.4$ equal 1320 or 13.20 or 132.0?
8. Does $2.9 \times 4.9$ equal 142.1 or 14.21 or 1.421?
9. Does $6.1 \times 8.8$ equal 536.8 or 5.368 or 53.68?
10. Does $3 \times 50.9$ equal 15.27 or 1.527 or 152.7?
11. Does $.4 \times .9$ equal .36 or .036 or 3.6?
12. Does $.6 \times .03$ equal .018 or 1.8 or .18?
13. Multiply .02 by .3 and put the decimal point in the answer by using the rule. Then do the example again by changing each decimal to a common fraction and multiplying the fractions. Do you get the same answer as before?

| Add | Multiply | Subtract | Add |
|---|---|---|---|
| 1. 3.25<br>14.50<br>1.75<br>26.12<br>1.09<br>4.38 | 2. 48.2<br>1.55 | 3. $12\frac{3}{4}$<br>$10\frac{1}{2}$ | 4. $3\frac{1}{2}$<br>$4\frac{3}{4}$<br>$2\frac{5}{8}$<br>$1\frac{1}{4}$<br>$3\frac{7}{8}$ |
| | Divide | Divide | |
| | 5. 6)30864 | 6. 32)8096 | |

| Add | Multiply | Subtract | Multiply |
|---|---|---|---|
| 7. \$2789.37<br>1098.85 | 8. $15 \times 2\frac{1}{2}$ | 9. 294073<br>199497 | 10. $6\frac{1}{2} \times 1\frac{1}{3}$ |

Find the answers:

11. How many ounces are there in 3 lb. 10 oz.?

12. Find the difference between $125\frac{1}{6}$ and $111\frac{2}{3}$.

13. Which is more, $\frac{5}{8}$ of 320 or $\frac{2}{3}$ of 312? how much more?

14. How many cents are there in 2 half dollars, 7 quarters, 9 dimes, and 15 nickels?

15. Find the sum of 8269, 7318, 4002, and 5077.

16. How much less than \$1000.00 is \$892.95?

17. What part of a gallon is 3 quarts?

18. Find the product of $4\frac{1}{2}$ and $1\frac{1}{3}$.

19. Jack's father says it costs \$.065 a mile to run his automobile. What does it cost to take a trip of 250 mi.?

20. Find the area and the perimeter of a garden that is 20 ft. long and $14\frac{1}{2}$ ft. wide.

21. Show that you know what each word or phrase means by using it in a sentence or by giving an illustration of it:

| | | |
|---|---|---|
| tenth | point off | common fraction |
| average | whole number | decimal places |
| product | decimal point | tenth of an inch |
| multiplicand | mixed decimal | hundredths place |



Add and check the work:

| | | | | |
|---|---|---|---|---|
| 1. \$5.54<br>4.49<br>9.15 | \$46.75<br>35.47<br>13.66 | \$73.05<br>21.87<br>32.68 | \$22.92<br>37.26<br>46.53 | \$330.40<br>121.76<br>456.27 |
| 2. \$3.17<br>.85<br>9.50 | \$81.69<br>7.36<br>34.56 | \$63.35<br>9.48<br>11.29 | \$85.29<br>52.07<br>8.55 | \$400.00<br>93.60<br>175.53 |
| 3. \$4.44<br>8.58<br>1.78<br>4.25 | \$11.35<br>66.43<br>21.12<br>13.77 | \$74.06<br>65.93<br>6.15<br>51.10 | \$11.39<br>7.97<br>24.88<br>6.22 | \$182.55<br>35.90<br>520.06<br>104.31 |
| 4. \$9.56<br>9.88<br>3.02<br>7.30<br>7.56 | \$15.82<br>7.49<br>65.78<br>21.23<br>43.10 | \$73.08<br>6.54<br>6.64<br>13.78<br>5.39 | \$32.27<br>49.94<br>74.07<br>32.90<br>25.49 | \$680.00<br>356.11<br>218.57<br>185.36<br>623.72 |

Subtract and check the work:

| | | | | |
|---|---|---|---|---|
| 5. \$8.15<br>5.28 | \$10.00<br>8.66 | \$56.22<br>9.85 | \$46.51<br>16.92 | \$398.74<br>248.76 |
| 6. \$6.48<br>3.75 | \$49.64<br>34.59 | \$56.19<br>54.92 | \$50.00<br>17.44 | \$116.39<br>81.58 |
| 7. \$8.16<br>6.48 | \$23.27<br>14.04 | \$55.93<br>36.57 | \$11.38<br>3.98 | \$903.72<br>627.86 |
| 8. \$8.74<br>4.57 | \$50.00<br>24.02 | \$38.97<br>12.35 | \$62.55<br>23.87 | \$724.24<br>133.75 |
| 9. \$9.00<br>7.06 | \$17.85<br>9.68 | \$20.00<br>18.25 | \$75.00<br>37.50 | \$700.00<br>96.37 |

Tell whether you add, subtract, multiply, or divide to get the answer. If the problem has two or three steps, tell what you do in each step.

1. You know how much it will cost to go to camp next summer. You also know how much money you have saved and that it is not enough. How do you find how much more money you need?

2. You know the number of feet in the length and also in the width of your garden. How do you find the number of square feet in your garden?

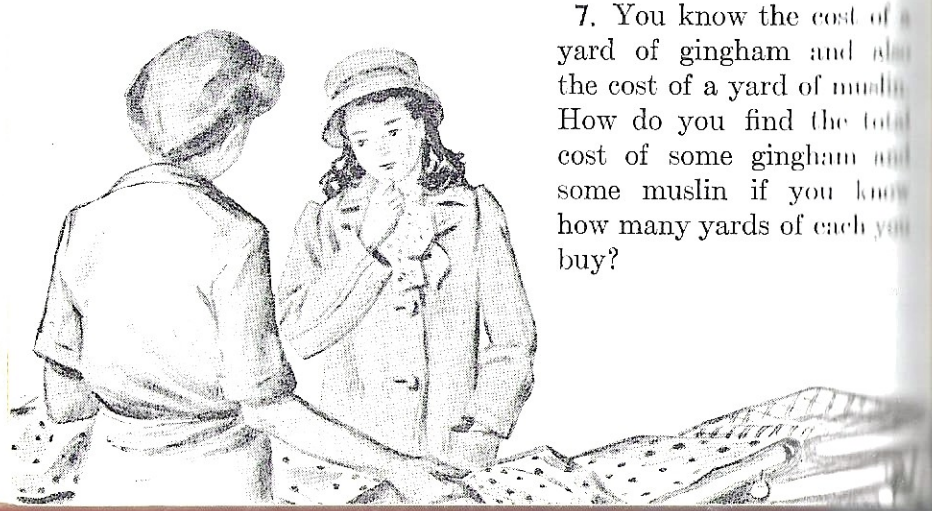
3. You know how many miles it is to Shady Farm and also your average walking speed in miles per hour. How do you find the number of hours it will take to walk to the farm?

4. You know how many boxes of cookies were sold at each stand at the school fair. You also know the price at which each box was sold. If half the money received for the cookies goes to the Cooking Club, how do you find out how much money the club gets?

5. You know the number of inches of rain that fell during each storm this month. How do you find the total number of inches of rainfall for the month?

6. You know the distance between two cities on the railroad and the number of hours a train takes to make this trip. How do you find the train's average speed per hour?

7. You know the cost of a yard of gingham and also the cost of a yard of muslin. How do you find the total cost of some gingham and some muslin if you know how many yards of each you buy?





1. Mr. West uses his car for business. Last year he drove 11,752 mi. in all. What was the average number of miles he drove per week? 1 yr. = 52 wk.

2. In December Mrs. King spent $76.57 in all for food. What was the average amount she spent for food per day? December has 31 days.

3. In the schools of Easton there are 15,675 pupils and 625 teachers. On the average, about how many pupils per teacher are there in Easton?

4. A bus driver drives his bus 227 mi. on each trip. Last year his total mileage on these trips was 77,414 mi. How many times did he make the trip last year?

Divide. Check by multiplying:

| | | | |
|---|---|---|---|
| 5. 74)7030 | 25)41300 | 212)60420 | 603)155574 |
| 6. 45)3330 | 37)74080 | 576)82464 | 647)216098 |
| 7. 21)2058 | 18)44378 | 122)83936 | 152)116128 |
| 8. 17)1520 | 96)27861 | 416)89440 | 868)455940 |
| 9. 25)1800 | 34)13274 | 285)60465 | 718)359718 |
| 10. 63)4725 | 86)40170 | 339)13014 | 685)257105 |
| 11. 27)1290 | 94)28695 | 274)23298 | 439)136968 |
| 12. 89)4460 | 31)10044 | 196)71960 | 382)175720 |
| 13. 38)3230 | 98)78716 | 115)57040 | 271)160974 |
| 14. 35)1930 | 19)76152 | 129)39732 | 399)287082 |

Add. Check the work by going over it:

| | | | | | | |
|---|---|---|---|---|---|---|
| 1. | $\frac{3}{10}$ | $2\frac{5}{16}$ | $3\frac{3}{4}$ | $4\frac{1}{12}$ | $7\frac{7}{8}$ | $4\frac{2}{3}$ |
| | $\frac{9}{10}$ | $1\frac{1}{2}$ | $8\frac{1}{2}$ | $5\frac{3}{4}$ | $2\frac{1}{2}$ | $1\frac{3}{4}$ |
| 2. | $\frac{3}{4}$ | $4\frac{2}{5}$ | $7\frac{2}{3}$ | $2\frac{1}{2}$ | $1\frac{9}{16}$ | $5\frac{1}{2}$ |
| | $\frac{1}{8}$ | $2\frac{1}{5}$ | $1\frac{1}{6}$ | $6\frac{1}{3}$ | $7\frac{1}{8}$ | $1\frac{4}{5}$ |
| | $\frac{7}{16}$ | $2\frac{1}{5}$ | $3\frac{5}{12}$ | $4\frac{1}{3}$ | $2\frac{1}{4}$ | $1\frac{3}{10}$ |
| 3. | $\frac{7}{12}$ | $6\frac{3}{5}$ | $4\frac{3}{4}$ | $3\frac{1}{16}$ | $8\frac{1}{2}$ | $3\frac{1}{2}$ |
| | $\frac{1}{12}$ | $5\frac{7}{10}$ | $7\frac{3}{4}$ | $2\frac{5}{8}$ | $9\frac{3}{4}$ | $6\frac{2}{3}$ |
| | $\frac{7}{12}$ | $2\frac{1}{2}$ | $3\frac{3}{4}$ | $3\frac{5}{16}$ | $4\frac{5}{12}$ | $6\frac{2}{5}$ |

Subtract. Check the work by going over it:

| | | | | | | |
|---|---|---|---|---|---|---|
| 4. | $\frac{5}{12}$ | $6\frac{1}{2}$ | $9\frac{4}{5}$ | $7\frac{7}{16}$ | $8\frac{1}{6}$ | $2\frac{11}{16}$ |
| | $\frac{1}{3}$ | $2\frac{7}{8}$ | $4\frac{1}{2}$ | $1\frac{1}{16}$ | $5\frac{3}{4}$ | $1\frac{1}{8}$ |
| 5. | $\frac{5}{8}$ | $5\frac{9}{10}$ | $6\frac{3}{4}$ | $3\frac{7}{10}$ | $7\frac{1}{3}$ | $4\frac{3}{4}$ |
| | $\frac{1}{2}$ | $4\frac{3}{10}$ | $6\frac{2}{3}$ | $2\frac{4}{5}$ | $4\frac{1}{2}$ | $\frac{7}{8}$ |
| 6. | $\frac{7}{12}$ | $3\frac{1}{2}$ | $8\frac{1}{6}$ | $9\frac{2}{3}$ | $6\frac{1}{4}$ | $5\frac{3}{10}$ |
| | $\frac{1}{12}$ | $1\frac{3}{16}$ | $3\frac{1}{2}$ | $5\frac{1}{2}$ | $\frac{7}{8}$ | $2\frac{3}{5}$ |

Multiply:

| | | | | |
|---|---|---|---|---|
| 7. | $\frac{1}{10} \times \frac{5}{8}$ | $2\frac{2}{3} \times \frac{1}{8}$ | $\frac{3}{4} \times 1\frac{1}{3}$ | $1\frac{1}{2} \times$ |
| 8. | $\frac{3}{4} \times \frac{3}{4}$ | $1\frac{3}{5} \times \frac{3}{8}$ | $\frac{5}{8} \times 1\frac{1}{2}$ | $2\frac{1}{2} \times$ |
| 9. | $5 \times \frac{7}{8}$ | $16 \times \frac{3}{4}$ | $\frac{3}{10} \times 2\frac{2}{3}$ | $10 \times$ |
| 10. | $7 \times \frac{1}{10}$ | $1\frac{3}{4} \times 5$ | $\frac{5}{8} \times 4\frac{4}{5}$ | $2\frac{1}{2} \times$ |
| 11. | $\frac{3}{8} \times 4$ | $2\frac{3}{8} \times 6$ | $\frac{2}{3} \times 2\frac{1}{4}$ | $3\frac{1}{2} \times$ |
| 12. | $\frac{4}{5} \times \frac{5}{6}$ | $3\frac{1}{5} \times \frac{3}{4}$ | $\frac{3}{4} \times 40$ | $1\frac{1}{5} \times$ |
| 13. | $\frac{5}{6} \times 7$ | $10 \times \frac{5}{8}$ | $6 \times 1\frac{1}{8}$ | $2\frac{2}{3} \times$ |



1. Which is larger, .5 or .05? 1.9 or 1.89?
2. Multiply 3.1 by 2; by .2; by .02.
3. In the following statement place a decimal point in the number so that the statement will be sensible: In an hour he has traveled 335 mi.
4. How many seconds are there in 1 min. 35 sec.?
5. Read these numbers: MCMIII, MDCXXX, DCCV.
6. If Jim walks at the rate of $3\frac{1}{2}$ mi. an hour, how many miles can he walk in 2 hr.? in 3 hr.?
7. Jack can walk a mile in 20 min. At this rate, how many miles an hour can he walk?
8. Add 7 to each number: 47, 59, 73, 26, 85.
9. How much more than $7\frac{3}{4}$ is 10?
10. Find the sum of $\frac{7}{16}$, $\frac{1}{16}$, $\frac{9}{16}$, and $\frac{3}{16}$.
11. In a lending library the charge for renting a book is 15¢ for 3 days and 3¢ for each extra day. Find the cost of renting a book for 6 days; for 10 days.
12. Divide each number by 4: 19, 33, 25, 40, 48.
13. Find $\frac{1}{2}$ of each number: 10, 17, $\frac{1}{2}$, $2\frac{1}{2}$, $4\frac{2}{3}$.
14. Add $2\frac{1}{2}$ and $4\frac{1}{2}$; $3\frac{1}{4}$ and $1\frac{1}{4}$; $1\frac{1}{2}$ and $1\frac{1}{4}$.
15. Read these numbers: 38,200,536; 1,406,082,004.
16. How many nickels will you have if you change a half dollar and a quarter into nickels?
17. Add .3, .9, .6, .8, and .4.
18. How many inches are there in 3 ft.? in 5 ft.? in $\frac{1}{4}$ ft.?
19. Find $\frac{3}{4}$ of each number: 12, 20, 28, 32, 40.
20. How many 6-inch pieces of wire can be cut from 1 yd. of wire? from 54 in. of wire?
21. Find the cost of sixty $1\frac{1}{2}$-cent stamps.

Change these decimals to fractions:

| | | | | | | |
|---|---|---|---|---|---|---|
| 1. | .53 | .50 | .3 | .267 | .045 | .008 |
| 2. | .09 | .07 | .4 | .160 | .023 | .009 |

Change these fractions to decimals:

| | | | | | | |
|---|---|---|---|---|---|---|
| 3. | $\frac{15}{100}$ | $\frac{831}{1000}$ | $\frac{7}{10}$ | $\frac{5}{100}$ | $\frac{16}{1000}$ | $\frac{8}{100}$ |
| 4. | $\frac{9}{100}$ | $\frac{12}{1000}$ | $\frac{1}{10}$ | $\frac{45}{100}$ | $\frac{9}{1000}$ | $\frac{95}{100}$ |

Tell which decimal is larger:

5. .53 or .5 .19 or .196 .3 or .03

Add up. Check by adding down:

| | | | | | | |
|---|---|---|---|---|---|---|
| 6. | 1.8 | .623 | 14.75 | .367 | $9.00 | 1.875 |
| | 2.9 | .147 | 11.50 | .460 | 3.74 | .750 |
| | 3.7 | .003 | 2.28 | .175 | 6.50 | 2.500 |

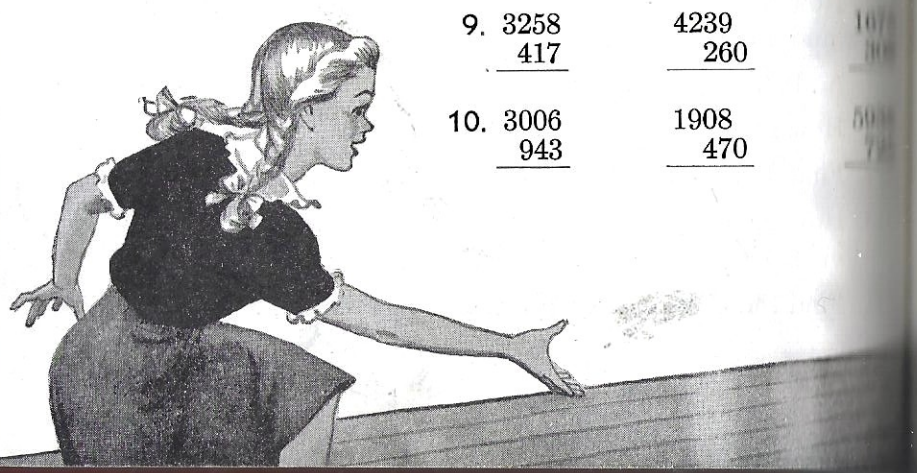
Subtract. Check the work by adding:

| | | | | | | |
|---|---|---|---|---|---|---|
| 7. | 6.0 | .625 | 12.75 | .875 | $4.00 | 6.02 |
| | 2.3 | .508 | 10.92 | .750 | 2.37 | 1.25 |

Multiply. Check by going over the work:

| | | | | | | |
|---|---|---|---|---|---|---|
| 8. | 6.3 | 6.5 | .59 | 3.1 | .52 | 10.4 |
| | 5 | 2.4 | 2.1 | .18 | 20 | .75 |

| | | | |
|---|---|---|---|
| 9. | 3258 | 4239 | 1675 |
| | 417 | 260 | 305 |
| 10. | 3006 | 1908 | 5928 |
| | 943 | 470 | 7.45 |





1. Peter sold tickets for a basketball game. He had 2 [illegible] dollar bills, 3 half dollars, 9 quarters, 11 dimes, and [illegible] nickels. Was this correct for 28 tickets at $.25 each?

2. On Monday 1.45 in. of rain fell and on Tuesday .78 in. fell. How many inches of rain fell on the two days?

3. Tom earns $.35 an hour when he works after school. How much does he earn by working $1\frac{1}{2}$ hr.?

4. A cake recipe calls for $\frac{1}{4}$ lb. of butter. How much butter is needed for $\frac{1}{2}$ the recipe? for twice the recipe?

5. A picture is $11\frac{1}{2}$ in. wide. The frame is $\frac{3}{4}$ in. wide. How wide is the framed picture? Remember that the frame goes on both ends of the picture.

6. Mr. Austin says it costs $.075 a mile to run his car. He drove 470 mi. last week. How much did this cost?

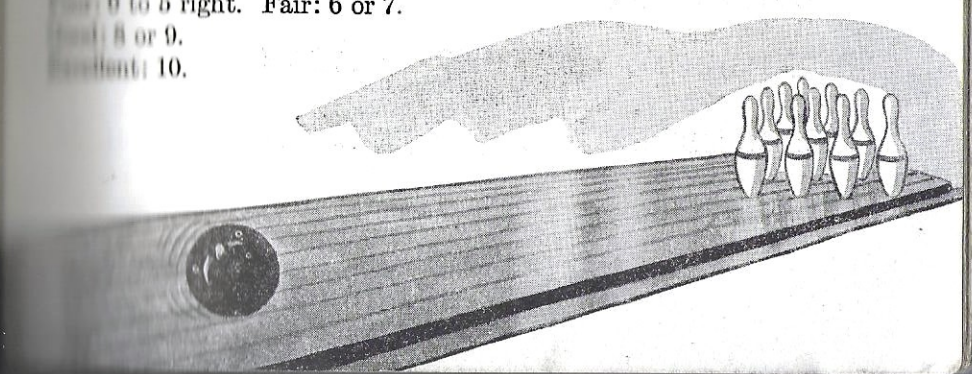
7. Mrs. Case bought $4\frac{3}{4}$ yd. of cloth for a dress. When the dress was finished she had 18 in. of cloth left. How many yards of cloth did she use for the dress?

8. How much cheaper is it to buy a gallon of paint at $4.00 than to buy 4 qt. at $.75 a quart?

9. Bill has a board 8 ft. long. If he cuts off a piece $1\frac{3}{4}$ ft. long and another piece $2\frac{1}{2}$ ft. long, how long is the piece that is left?

10. A one-way ticket by air from New York to France costs $312. A round-trip ticket is $561.60. How much less is a round-trip ticket than two one-way tickets?

Fair: 6 or 7.
Good: 8 or 9.
Excellent: 10.



If you miss more than one example in any row, turn to the Practice Pages for that row.

| | | | | PRACTICE PAGES |
|---|---|---|---|---|
| Tell which decimal is larger: | | | | |
| 1. .7 or .69 | .9 or .09 | .28 or .037 | | 124 |
| Add up. Check by adding down: | | | | |
| 2. 1.9 | 1.81 | $4.38 | 4.750 | 126 |
| 7.4 | 4.79 | 4.67 | 1.125 | |
| 2.8 | 6.77 | .99 | 3.500 | |
| 6.2 | 2.05 | 1.56 | 7.000 | |
| Subtract. Check by adding: | | | | |
| 3. 9.0 | 5.75 | $8.00 | 2.375 | 129 |
| 4.6 | 2.80 | 3.45 | 1.750 | |
| Multiply and check: | | | | |
| 4. 1.5 | .08 | .003 | .182 | 140 |
| 6 | 7 | 8 | 36 | |
| 5. 2.38 | .95 | .16 | 2.3 | 142, 144 |
| 4.7 | 1.4 | .3 | .04 | |
| 6. 2593 | 5007 | | 3680 | 132 |
| 469 | 209 | | 490 | |
| Divide and check: | | | | |
| 7. 443)12360 | 186)108066 | | 209)63954 | 103, 104 |
| 8. 816)3135072 | | | 493)1523370 | 104, 106 |

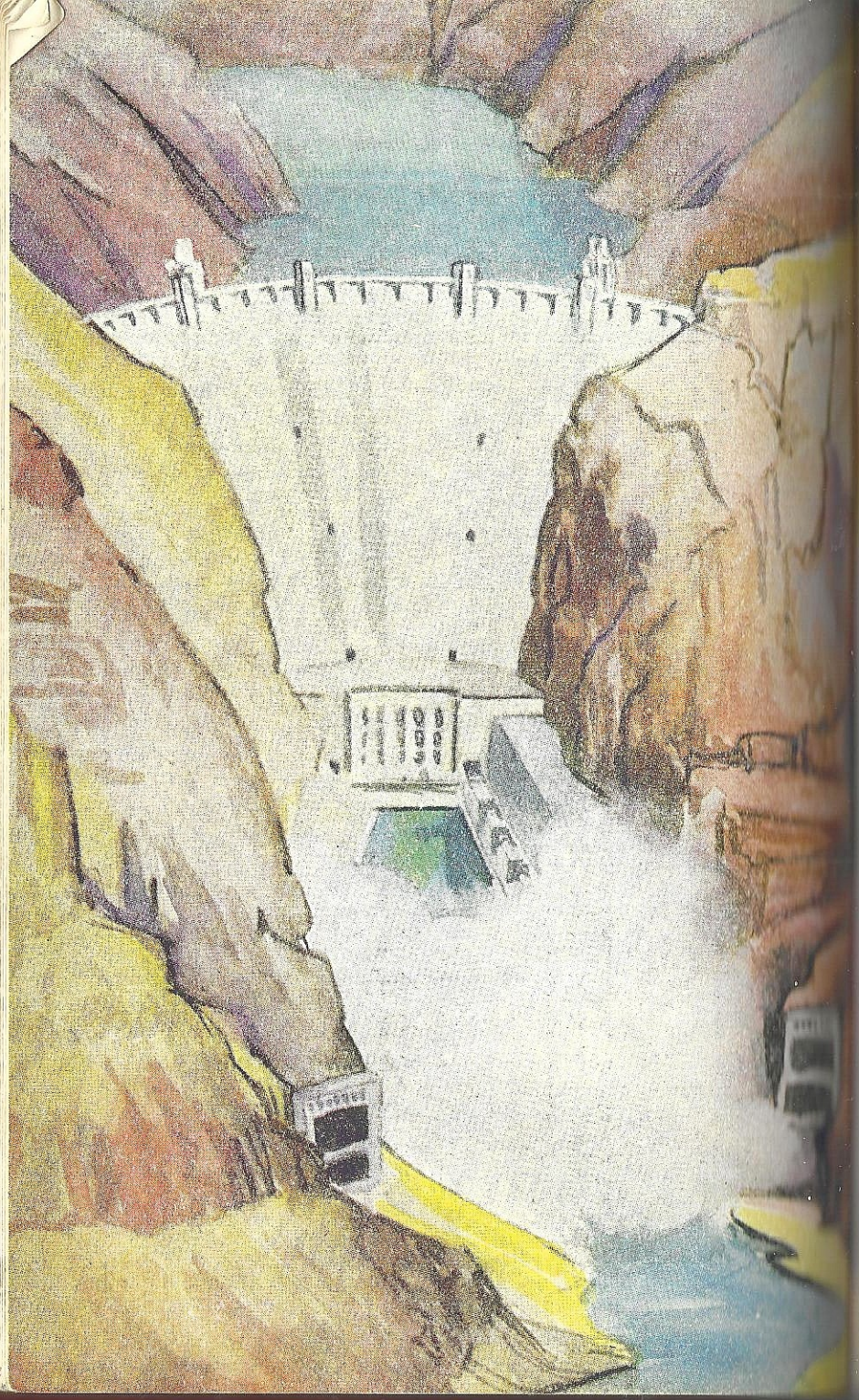
Diagnostic test.



If you miss more than one example in any row, turn to the Practice Pages for that row.

| | | | | | PRACTICE PAGES |
|---|---|---|---|---|---|
| Add and check the work: | | | | | |
| 1. $2\frac{1}{4}$ | $3\frac{4}{5}$ | $4\frac{2}{3}$ | $6\frac{3}{4}$ | $3\frac{7}{8}$ | 57, 67 |
| $1\frac{1}{2}$ | $2\frac{3}{10}$ | $1\frac{1}{2}$ | $2\frac{5}{6}$ | $1\frac{1}{6}$ | 68 |
| $2\frac{1}{4}$ | $5\frac{1}{2}$ | $1\frac{2}{3}$ | $4\frac{1}{2}$ | $8\frac{2}{3}$ | |
| Subtract and check the work: | | | | | |
| 2. $6\frac{7}{8}$ | $4\frac{2}{5}$ | $7\frac{1}{2}$ | $3\frac{1}{8}$ | $9\frac{7}{12}$ | 58, 61 |
| $3\frac{1}{4}$ | $2\frac{9}{10}$ | $5\frac{2}{3}$ | $2\frac{3}{4}$ | $4\frac{1}{6}$ | |
| 3. $4\frac{1}{8}$ | $9\frac{7}{10}$ | $5\frac{1}{6}$ | $8\frac{5}{8}$ | $2\frac{1}{6}$ | 68 |
| $1\frac{1}{4}$ | $3\frac{3}{4}$ | $4\frac{3}{8}$ | $4\frac{1}{6}$ | $1\frac{3}{4}$ | |
| Multiply and check the work: | | | | | |
| 4. $\frac{3}{8} \times 32$ | $\frac{3}{4} \times 24$ | $\frac{1}{2} \times 14$ | | | 76 |
| 5. $\frac{3}{5} \times 20$ | $\frac{3}{5} \times 11$ | $\frac{5}{6} \times 13$ | | | 77 |
| 6. $1\frac{1}{3} \times 15$ | $2\frac{1}{3} \times 10$ | $4\frac{1}{4} \times 15$ | | | 79 |
| 7. $8 \times \frac{2}{5}$ | $3 \times \frac{7}{8}$ | $9 \times \frac{3}{4}$ | | | 80 |
| 8. $7 \times 2\frac{1}{4}$ | $5 \times 3\frac{2}{3}$ | $8 \times 1\frac{1}{5}$ | | | 80 |
| 9. $\frac{1}{4} \times \frac{1}{3}$ | $\frac{2}{3} \times \frac{4}{5}$ | $\frac{3}{8} \times \frac{1}{2}$ | | | 89 |
| 10. $\frac{1}{6} \times \frac{3}{8}$ | $\frac{2}{3} \times \frac{3}{5}$ | $\frac{3}{4} \times \frac{2}{5}$ | | | 89 |
| 11. $6 \times \frac{2}{3}$ | $8 \times \frac{3}{4}$ | $6 \times \frac{7}{12}$ | | | 91 |
| 12. $\frac{3}{8} \times \frac{1}{3}$ | $\frac{4}{5} \times \frac{5}{8}$ | $\frac{5}{6} \times \frac{3}{5}$ | | | 91 |
| 13. $8 \times \frac{5}{6}$ | $6 \times \frac{3}{4}$ | $\frac{3}{8} \times 10$ | | | 92 |
| 14. $\frac{8}{10} \times \frac{8}{9}$ | $\frac{15}{16} \times \frac{4}{9}$ | $\frac{5}{6} \times \frac{9}{10}$ | | | 92 |
| 15. $\frac{2}{3} \times 2\frac{1}{2}$ | $\frac{1}{6} \times 2\frac{1}{4}$ | $1\frac{1}{3} \times \frac{3}{4}$ | | | 99 |
| 16. $2\frac{2}{3} \times 2\frac{1}{4}$ | $1\frac{7}{8} \times 1\frac{1}{5}$ | $1\frac{1}{8} \times 3\frac{1}{3}$ | | | 99 |

Diagnostic test



CHAPTER FIVE

# Dividing Fractions

## HOOVER DAM

1. For centuries the Colorado River ran wild, cutting into the surface of the earth to form the Grand Canyon, carrying off the topsoil, and flooding the valleys near its mouth. To prevent these floods, our Government built Hoover Dam across the Colorado River. This dam, completed in 1936, is our tallest dam. The dam itself is 726 ft. high. To get an idea of the great height of this dam, think of a skyscraper having 56 stories each 13 ft. high. Would such a skyscraper be about 726 ft. high?

2. Hoover Dam is 1300 ft. wide across the top. How many feet make 1 mi.? About what part of a mile is 1300 ft.?

3. Hoover Dam is made of concrete. In order that the concrete should knit together as one solid piece, it was poured continuously, the work going on day and night, Sundays and holidays, for two years. It took 5,000,000 barrels of cement, each weighing 376 lb., to make the concrete. How many pounds of cement were used in all? How many truck loads would 5,000,000 barrels of cement make if there were 25 barrels in each truck load? What did the cement cost at an average of $1.60 a barrel?

1. When concrete is made it generates heat which may cause it to crack as it dries. To avoid this danger at Hoover Dam the concrete was kept cool as it was poured by imbedding in it 600 mi. of pipe, through which ice water was circulated. If 600 mi. of pipe were laid in a straight line, it would be a very long line. Name some city 600 mi. distant from your town to which this pipe would reach.

2. To produce the ice water that cooled the concrete, an ice plant was built at Hoover Dam. This plant was large enough to make 2,000,000 lb. of ice a day. How many families per day would 2,000,000 lb. of ice serve if each family used 25 lb. of ice daily?

3. The water of the Colorado River, held back by Hoover Dam, forms Lake Mead which is the largest artificial lake in the world. The water in the lake is 600 ft. deep at the dam. Lake Mead is 120 mi. long and covers a total area of 162,700 acres. About how many square miles does Lake Mead cover? 640 acres = 1 sq. mi.

4. Great Salt Lake in Utah has an area of 2360 sq. mi. Is Lake Mead about $\frac{1}{9}$ or $\frac{1}{10}$ the size of Great Salt Lake?

5. The amount of water in Lake Mead is so great that it is beyond comprehension. The lake contains 334,000,000,000 barrels of water. Read this number. The total population of the world is about 2,000,000,000 persons. If all these persons could share equally the water of Lake Mead, how many barrels of water would each one get?

6. There is a huge electric power plant at Hoover Dam which is run by water power. The electricity produced at this plant is sold to cities as far distant as Los Angeles, California. During the first 6 years of the operation of this power plant, the sales of electricity amounted to a total of $18,210,000. Find the average amount received per year from these sales.



1. Jack has to order some chopped meat for the Scout hike and campfire next Saturday. He will allow $\frac{1}{4}$ lb. of meat for each person. How many pounds of meat should he order for 37 persons? for 27 persons? for 25 persons?

2. If Jack orders $6\frac{3}{4}$ lb. of chopped meat at $.45 a pound, how much will the bill be?

3. The campfire will be at Blue Lake or at Bear Mountain Lake. It is $6\frac{1}{4}$ mi. to Blue Lake and $4\frac{1}{2}$ mi. to Bear Mountain Lake. How much farther is it to Blue Lake than to Bear Mountain Lake?

4. If the boys decide to go to Blue Lake, how many miles will they walk going there and back?

Add and check:

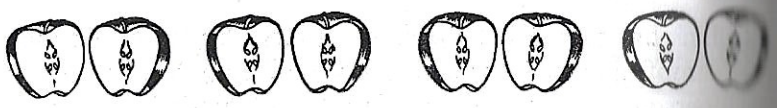
| | | | | | | |
|---|---|---|---|---|---|---|
| 5. | $4\frac{9}{10}$ | $5\frac{2}{3}$ | $1\frac{1}{2}$ | $6\frac{3}{4}$ | $2\frac{7}{10}$ | $4\frac{1}{2}$ | $8\frac{1}{3}$ |
| | $9\frac{7}{10}$ | $2\frac{5}{6}$ | $1\frac{1}{3}$ | $3\frac{5}{6}$ | $1\frac{3}{5}$ | $6\frac{5}{8}$ | $5\frac{5}{12}$ |

Subtract and check:

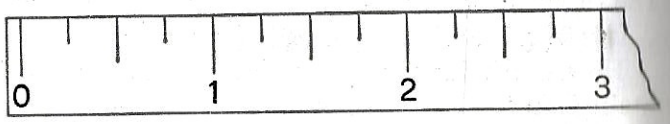
| | | | | | | |
|---|---|---|---|---|---|---|
| 6. | $5\frac{9}{10}$ | $4\frac{1}{2}$ | $9\frac{5}{6}$ | $6\frac{3}{8}$ | $8\frac{1}{12}$ | $2\frac{5}{6}$ | $7\frac{3}{4}$ |
| | $3\frac{9}{10}$ | $2\frac{1}{5}$ | $4\frac{1}{8}$ | $5\frac{3}{4}$ | $3\frac{5}{6}$ | $1\frac{1}{2}$ | $5\frac{5}{16}$ |

Multiply and check:

| | | | |
|---|---|---|---|
| 7. $6 \times \frac{2}{3}$ | $\frac{1}{3} \times \frac{1}{3}$ | $\frac{3}{8} \times 2\frac{2}{3}$ | $3\frac{1}{2} \times 3\frac{1}{3}$ |
| 8. $\frac{1}{8} \times \frac{2}{3}$ | $\frac{7}{8} \times \frac{2}{3}$ | $3 \times 1\frac{1}{6}$ | $2\frac{3}{4} \times 12$ |
| 9. $\frac{3}{4} \times 6$ | $8 \times \frac{5}{6}$ | $\frac{5}{8} \times 4\frac{4}{5}$ | $15 \times 1\frac{1}{4}$ |
| 10. $\frac{1}{3} \times \frac{3}{4}$ | $\frac{5}{12} \times \frac{3}{10}$ | $\frac{3}{16} \times 2\frac{2}{3}$ | $5\frac{1}{4} \times 3\frac{1}{3}$ |
| 11. $6 \times \frac{1}{2}$ | $\frac{3}{10} \times 8$ | $\frac{4}{5} \times 4\frac{3}{8}$ | $6\frac{2}{3} \times \frac{9}{10}$ |
| 12. $7 \times \frac{3}{8}$ | $\frac{15}{16} \times \frac{1}{10}$ | $\frac{2}{3} \times 1\frac{1}{8}$ | $3\frac{3}{8} \times 5\frac{1}{3}$ |
| 13. $\frac{3}{4} \times \frac{1}{2}$ | $\frac{9}{10} \times 20$ | $\frac{7}{8} \times 12$ | $3\frac{3}{5} \times \frac{15}{16}$ |
| 14. $\frac{1}{3} \times \frac{1}{2}$ | $24 \times \frac{3}{16}$ | $4 \times 2\frac{1}{8}$ | $8\frac{1}{3} \times \frac{3}{10}$ |
| 15. $\frac{1}{8} \times \frac{3}{8}$ | $\frac{10}{11} \times \frac{11}{12}$ | $\frac{4}{5} \times 3\frac{1}{3}$ | $16 \times 1\frac{3}{8}$ |



1. Here are 4 apples each cut into halves. How many halves are there in 4 apples? Another way to ask this question is like this: $4 \div \frac{1}{2} = ?$ You see that the answer to $4 \div \frac{1}{2}$ is 8, which is the same as the answer to $4 \times 2$.




2. The picture above shows 3 in. of a foot ruler. Each inch is divided into fourths of an inch. How many fourths of an inch are there in 3 in.? Since there are 4 fourths in 1 in., there are $3 \times 4$ fourths, or 12 fourths, in 3 in. This shows that $3 \div \frac{1}{4} = 12$. You see that the answer to $3 \div \frac{1}{4}$ is the same as the answer to $3 \times 4$.

3. Exercises in the division of fractions are often worked by inverting the divisor. A divisor like $\frac{1}{4}$ can be *inverted* by turning it upside down like this: $\frac{4}{1}$. Since $\frac{4}{1}$ equals 4, you see that $\frac{1}{4}$ becomes 4 when inverted. When you invert $\frac{3}{4}$ you get $\frac{4}{3}$. You can also invert a number like 5 if you first write it as the fraction $\frac{5}{1}$; inverting $\frac{5}{1}$ you get $\frac{1}{5}$. Invert the following: $\frac{2}{3}$, $\frac{1}{6}$, 7, $\frac{5}{8}$, $\frac{3}{1}$, 12, $\frac{5}{4}$.

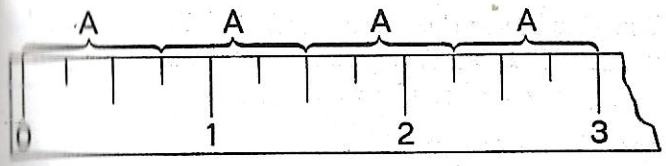
4. In ex. 2 you found that $3 \div \frac{1}{4}$ has the same answer as $3 \times 4$. This means that you can do the division example $3 \div \frac{1}{4}$ by turning it into the multiplication example $3 \times 4$. If you invert $\frac{1}{4}$, you get 4. So you do the work for $3 \div \frac{1}{4}$ by inverting the divisor $\frac{1}{4}$ and multiplying, like this:

$$3 \times \frac{4}{1} = 3 \times 4 = 12$$

Find the answers. Invert the divisor and multiply:

| | | | | |
|---|---|---|---|---|
| 5. $6 \div \frac{1}{3}$ | $8 \div \frac{1}{2}$ | $2 \div \frac{1}{8}$ | $3 \div \frac{1}{3}$ | $5 \div \frac{1}{2}$ |
| 6. $4 \div \frac{1}{5}$ | $9 \div \frac{1}{4}$ | $7 \div \frac{1}{6}$ | $6 \div \frac{1}{4}$ | $9 \div \frac{1}{3}$ |






1. The ruler above shows 3 in. divided into quarter inches. The parts marked *A* are each $\frac{3}{4}$ in. long. How many parts like *A* are there in 3 in.? Then how many times is $\frac{3}{4}$ in. contained in 3 in.? You can write the answer to the question like this: $3 \div \frac{3}{4} = 4$.

2. Here is another way to show that $3 \div \frac{3}{4} = 4$. Change 3 to $\frac{12}{4}$. Then divide $\frac{12}{4}$ by $\frac{3}{4}$; to do this think "12 *fourths* ÷ 3 *fourths* = 12 ÷ 3, or 4, just as 12 *books* ÷ 3 *books* = 4."

3. Ex. 1 and 2 show that the answer is 4 when you divide 3 by $\frac{3}{4}$. A quick way to get this answer is to invert the divisor and multiply like this: $3 \div \frac{3}{4} = \frac{3}{1} \times \frac{4}{3} = \frac{12}{3} = 4$.

> To divide by a fraction, invert the divisor and multiply.

4. In the division of fractions you can often shorten the work by cancellation, as shown below:

$$6 \div \frac{4}{5} = \frac{6}{1} \times \frac{5}{4} = \frac{\overset{3}{\cancel{6}}}{1} \times \frac{5}{\underset{2}{\cancel{4}}} = \frac{15}{2} = 7\tfrac{1}{2}$$

Divide. Cancel when you can:

| | | | | |
|---|---|---|---|---|
| 5. $8 \div \frac{4}{5}$ | $6 \div \frac{9}{10}$ | $3 \div \frac{5}{6}$ | $12 \div \frac{3}{4}$ | $15 \div \frac{5}{16}$ |
| 6. $7 \div \frac{3}{4}$ | $6 \div \frac{5}{6}$ | $4 \div \frac{4}{5}$ | $21 \div \frac{7}{8}$ | $20 \div \frac{5}{8}$ |
| 7. $4 \div \frac{2}{3}$ | $8 \div \frac{3}{4}$ | $9 \div \frac{2}{3}$ | $15 \div \frac{9}{10}$ | $12 \div \frac{3}{8}$ |
| 8. $9 \div \frac{9}{8}$ | $6 \div \frac{2}{5}$ | $5 \div \frac{3}{4}$ | $10 \div \frac{1}{8}$ | $10 \div \frac{3}{4}$ |
| 9. $9 \div \frac{9}{8}$ | $3 \div \frac{2}{3}$ | $7 \div \frac{4}{5}$ | $18 \div \frac{3}{5}$ | $14 \div \frac{7}{8}$ |

1. The girls in our class have made $10\frac{1}{2}$ lb. of candy for the school sale. They want to put it in boxes holding $\frac{3}{4}$ lb. each. How many boxes of candy will they have?

Change $10\frac{1}{2}$ to the improper fraction $\frac{21}{2}$. Invert the divisor $\frac{3}{4}$ which gives $\frac{4}{3}$; then multiply. The quotient is 14. Check the work by going over it. The girls will have 14 boxes of candy.

$$10\tfrac{1}{2} \div \frac{3}{4} = \frac{\overset{7}{\cancel{21}}}{\underset{1}{\cancel{2}}} \times \frac{\overset{2}{\cancel{4}}}{\underset{1}{\cancel{3}}} = 14$$

2. Mary can do ex. 1 another way. She changes $10\frac{1}{2}$ lb. to 168 oz. and $\frac{3}{4}$ lb. to 12 oz. Then she divides 168 oz. by 12 oz. as shown at the right. The answer is 14, which is the same as the answer obtained in ex. 1. The best way to work this problem is shown in ex. 1. The longer method used by Mary is a check which shows that 14 is the right answer.

$10\frac{1}{2}$ lb. $= 10\frac{1}{2} \times 16$ oz. $= 168$ oz.
$\frac{3}{4}$ lb. $= \frac{3}{4} \times 16$ oz. $= 12$ oz.
168 oz. $\div$ 12 oz. $= 14$

3. Fractions are divided by fractions just as mixed numbers are divided by fractions. In either case invert the divisor and multiply. For example, to divide $\frac{7}{8}$ by $\frac{3}{4}$, do the work as shown at the right.

$$\frac{7}{8} \div \frac{3}{4} = \frac{7}{\underset{2}{\cancel{8}}} \times \frac{\overset{1}{\cancel{4}}}{3} = \frac{7}{6} = 1\tfrac{1}{6}$$

Divide. Check the work by going over it:

| | | | | |
|---|---|---|---|---|
| 4. $2\frac{3}{4} \div \frac{1}{2}$ | $5\frac{1}{3} \div \frac{2}{3}$ | $\frac{2}{3} \div \frac{1}{2}$ | $\frac{3}{4} \div \frac{1}{3}$ | $\frac{7}{8} \div \frac{3}{4}$ |
| 5. $1\frac{1}{8} \div \frac{3}{4}$ | $3\frac{1}{2} \div \frac{3}{5}$ | $\frac{1}{4} \div \frac{1}{8}$ | $\frac{1}{2} \div \frac{3}{8}$ | $\frac{5}{8} \div \frac{3}{4}$ |
| 6. $6\frac{2}{3} \div \frac{5}{6}$ | $1\frac{1}{8} \div \frac{2}{3}$ | $\frac{1}{4} \div \frac{3}{4}$ | $\frac{3}{4} \div \frac{2}{3}$ | $\frac{1}{3} \div \frac{3}{4}$ |
| 7. $1\frac{1}{2} \div \frac{4}{5}$ | $2\frac{1}{2} \div \frac{2}{5}$ | $\frac{2}{3} \div \frac{1}{5}$ | $\frac{2}{3} \div \frac{5}{6}$ | $\frac{1}{4} \div \frac{3}{4}$ |
| 8. $2\frac{2}{3} \div \frac{1}{4}$ | $1\frac{1}{4} \div \frac{3}{4}$ | $\frac{1}{2} \div \frac{3}{4}$ | $\frac{1}{8} \div \frac{3}{4}$ | $\frac{3}{10} \div \frac{3}{4}$ |



1. Jane's mother has $2\frac{1}{4}$ yd. of linen which she wants to use for towels. If she makes each towel $\frac{3}{4}$ yd. long, how many towels can she make?

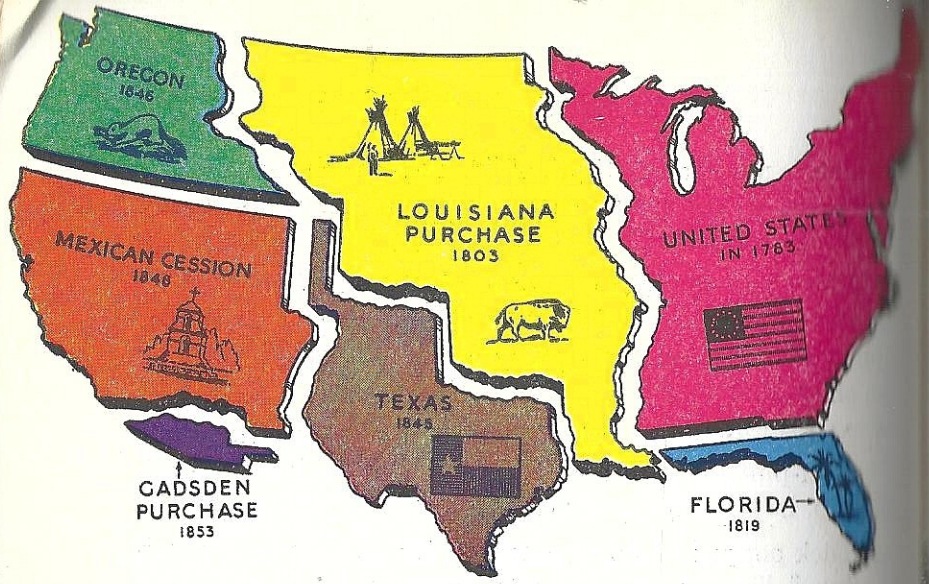
2. Mary has offered to make armbands of ribbon for the boys who have charge of the playground. She has a piece of ribbon $2\frac{1}{3}$ yd. long. How many armbands each $\frac{1}{3}$ yd. long can she make?

3. Mr. White has $3\frac{1}{2}$ gal. of maple sirup. He wants to put it in half-pint bottles. If each half-pint bottle holds $\frac{1}{16}$ gal. of sirup, how many bottles can he fill?

4. Dick popped $3\frac{3}{4}$ lb. of popcorn. He put it in boxes each holding $\frac{3}{8}$ lb. and gave it to the boys at his party. How many boxes of popcorn did Dick have?

Divide. Cancel when possible. Check the work by going over it:

| | | | | |
|---|---|---|---|---|
| 5. $\frac{1}{8} \div \frac{1}{8}$ | $\frac{3}{8} \div \frac{1}{2}$ | $4\frac{1}{5} \div \frac{3}{5}$ | $3\frac{1}{8} \div \frac{5}{6}$ |
| 6. $\frac{3}{8} \div \frac{1}{4}$ | $\frac{3}{4} \div \frac{3}{16}$ | $7\frac{1}{2} \div \frac{3}{10}$ | $12\frac{1}{2} \div \frac{5}{8}$ |
| 7. $\frac{3}{4} \div \frac{9}{16}$ | $\frac{5}{16} \div \frac{3}{8}$ | $4\frac{1}{2} \div \frac{3}{8}$ | $7\frac{1}{2} \div \frac{9}{10}$ |
| 8. $\frac{3}{8} \div \frac{3}{4}$ | $\frac{3}{4} \div \frac{5}{12}$ | $1\frac{7}{8} \div \frac{3}{4}$ | $4\frac{2}{3} \div \frac{7}{8}$ |
| 9. $\frac{5}{16} \div \frac{1}{4}$ | $\frac{5}{16} \div \frac{1}{8}$ | $2\frac{1}{5} \div \frac{3}{5}$ | $4\frac{1}{5} \div \frac{3}{10}$ |
| 10. $\frac{3}{8} \div \frac{4}{5}$ | $\frac{1}{12} \div \frac{2}{3}$ | $6\frac{3}{4} \div \frac{15}{16}$ | $3\frac{3}{8} \div \frac{3}{10}$ |
| 11. $\frac{3}{4} \div \frac{1}{6}$ | $\frac{5}{12} \div \frac{1}{6}$ | $3\frac{1}{3} \div \frac{3}{8}$ | $6\frac{1}{4} \div \frac{3}{8}$ |
| 12. $\frac{5}{8} \div \frac{5}{8}$ | $\frac{11}{16} \div \frac{3}{4}$ | $8\frac{1}{4} \div \frac{3}{4}$ | $3\frac{1}{8} \div \frac{5}{12}$ |
| 13. $\frac{3}{8} \div \frac{1}{4}$ | $\frac{9}{16} \div \frac{1}{12}$ | $2\frac{2}{3} \div \frac{2}{3}$ | $2\frac{1}{3} \div \frac{1}{8}$ |
| 14. $\frac{15}{16} \div \frac{5}{8}$ | $\frac{7}{8} \div \frac{1}{10}$ | $2\frac{2}{5} \div \frac{9}{10}$ | $5\frac{1}{4} \div \frac{3}{16}$ |
| 15. $\frac{1}{12} \div \frac{1}{3}$ | $\frac{5}{8} \div \frac{3}{4}$ | $3\frac{1}{2} \div \frac{5}{6}$ | $2\frac{4}{5} \div \frac{9}{10}$ |
| 16. $\frac{9}{16} \div \frac{1}{4}$ | $\frac{5}{6} \div \frac{1}{2}$ | $3\frac{3}{4} \div \frac{3}{10}$ | $5\frac{1}{3} \div \frac{5}{6}$ |
| 17. $\frac{1}{8} \div \frac{1}{12}$ | $\frac{1}{4} \div \frac{2}{3}$ | $3\frac{3}{5} \div \frac{3}{10}$ | $3\frac{1}{6} \div \frac{3}{10}$ |
| 18. $\frac{5}{8} \div \frac{5}{6}$ | $\frac{4}{5} \div \frac{1}{6}$ | $2\frac{1}{4} \div \frac{3}{8}$ | $1\frac{1}{8} \div \frac{9}{10}$ |




## THE GROWTH OF OUR COUNTRY

**1.** In 1783 the United States had an area of 888,811 sq. mi. Our country at that time was made up of the Thirteen Original States. They stretched from Canada to southern Georgia and from the Atlantic Ocean to the Mississippi River.

**2.** The United States in 1803 bought from France a vast region west of the Mississippi River. This great region was called the Louisiana Territory and it added 827,192 sq. mi. of new land to our country. What was the area of the United States after the Louisiana Purchase? See ex. 1.

**3.** During the 50 years following the Louisiana Purchase we added these new regions to our country:

| | | |
|---|---|---|
| 1819 | East and West Florida | 72,003 sq. mi. |
| 1845 | Republic of Texas | 390,144 sq. mi. |
| 1846 | Oregon Country | 285,580 sq. mi. |
| 1848 | Mexican Cession | 529,017 sq. mi. |
| 1853 | Gadsden Purchase | 29,640 sq. mi. |

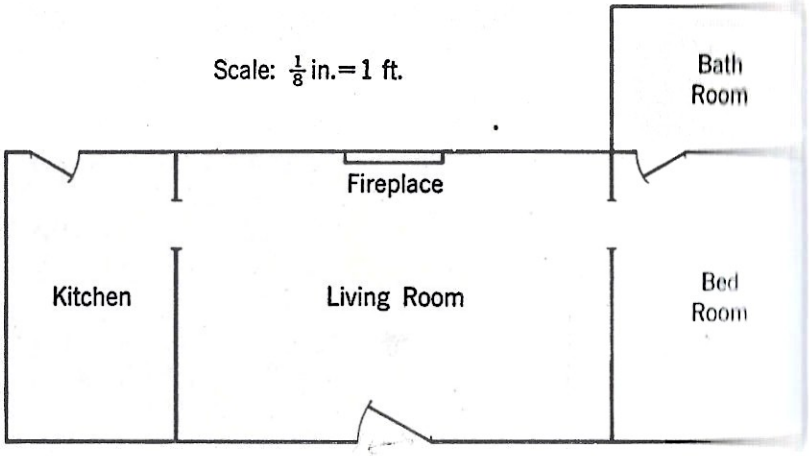
These additions brought the continental area of the United States, not including Alaska, up to its present size. What is



the total continental area of the United States at present? Include the area after the Louisiana Purchase. See ex. 2.

**4.** The Louisiana Purchase cost us $23,213,567; the Floridas cost $6,674,057; Texas cost $15,496,447; the Mexican Cession cost $16,295,148; the Gadsden Purchase cost $10,000,000. There was no payment in money for the Oregon Country. What was the total cost to us of the regions just mentioned?

**5.** The Louisiana Purchase was the greatest real-estate transaction in all history. For $23,213,567 we acquired 827,192 sq. mi. of land, which almost doubled the area of our country as it was in 1783. Mary says that the Louisiana Purchase cost us about $28 per square mile, or about $4\frac{3}{8}$¢ per acre. Is Mary right? 640 acres = 1 sq. mi.




## A SUMMER BUNGALOW

1. The picture above is the floor plan of a summer bungalow. This plan is drawn to a scale of $\frac{1}{8}$ in. = 1 ft. On this drawing, how many feet are represented by $\frac{3}{8}$ in.? by $\frac{5}{8}$ in.? by $\frac{7}{8}$ in.? by 1 in.? by $1\frac{1}{8}$ in.?

2. On the floor plan measure the length of the living room with your ruler. Tom says it is $2\frac{1}{4}$ in. long. Is he right? On your ruler count the number of 8ths of an inch there are in $2\frac{1}{4}$ in. How many feet long is the room? How many feet wide is the room?

3. Ann can find how many 8ths of an inch there are in $2\frac{1}{4}$ in. without counting. She divides $2\frac{1}{4}$ in. by $\frac{1}{8}$ in. What answer does she get? Is her answer the same as Tom's? Use Ann's way to find the width of the living room.

4. On the floor plan measure with your ruler the length and the width of the kitchen, the bedroom, and the bathroom. Use Ann's method to tell how many feet long and how many feet wide each room is.

5. How many feet wide is the fireplace? the front door? the door between the living room and the kitchen?





Subtraction Test 3a. Time: 4 min.

| | | | |
|---|---|---|---|
| 1. 53826 | 47918 | 42953 | 16660 |
| 19528 | 19337 | 26457 | 14867 |
| 2. 40092 | 42157 | 30701 | 20000 |
| 17332 | 38168 | 15618 | 10386 |
| 3. 99316 | 97165 | 70577 | 82226 |
| 67441 | 25759 | 14335 | (12) 22474 |

Subtraction Test 3b. Time: 4 min.

| | | | |
|---|---|---|---|
| 4. 78943 | 64413 | 61843 | 40000 |
| 25668 | 35446 | 26783 | 22705 |
| 5. 59623 | 62152 | 50929 | 70774 |
| 39999 | 26309 | 39259 | 15878 |
| 6. 71588 | 33959 | 52400 | 41562 |
| 58549 | 17066 | 51377 | (12) 18891 |

Subtraction Test 3c. Time: 4 min.

| | | | |
|---|---|---|---|
| 7. 87887 | 70135 | 59127 | 89663 |
| 34235 | 41557 | 46443 | 49555 |
| 8. 61400 | 88888 | 83004 | 61619 |
| 38909 | 62976 | 68429 | 16634 |
| 9. 97335 | 50000 | 62174 | 26006 |
| 17473 | 12437 | 12213 | (12) 23768 |

Improvement Tests.

1. Elizabeth had $\frac{1}{2}$ lb. of butter. She divided it into 2 equal pieces. What part of a pound was each piece?

When you divide any number by 2, you take $\frac{1}{2}$ of the number. So $\frac{1}{2} \div 2$ is the same as $\frac{1}{2}$ of $\frac{1}{2}$. This shows that $\frac{1}{2} \div 2 = \frac{1}{2} \times \frac{1}{2}$, or $\frac{1}{4}$. Each piece of butter was $\frac{1}{4}$ lb.

Now do the example $\frac{1}{2} \div 2$ by inverting the divisor 2 and multiplying. This gives $\frac{1}{2} \times \frac{1}{2}$, or $\frac{1}{4}$, as before. You see that the rule for inverting the divisor can also be used when the divisor is a whole number like 2.

$$\frac{1}{2} \div 2 = \frac{1}{2} \div \frac{2}{1} = \frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$$

2. On the 5 school days last week Joe practiced $3\frac{3}{4}$ hr. on his horn. What was the average time he practiced each day?

You must divide $3\frac{3}{4}$ by 5. First change $3\frac{3}{4}$ to $\frac{15}{4}$ and write 5 as $\frac{5}{1}$. Next invert $\frac{5}{1}$ which gives $\frac{1}{5}$; then multiply. Joe practiced an average of $\frac{3}{4}$ hr. per day.

$$3\frac{3}{4} \div 5 = \frac{15}{4} \div \frac{5}{1} = \frac{\overset{3}{\cancel{15}}}{4} \times \frac{1}{\underset{1}{\cancel{5}}} = \frac{3}{4}$$

*To divide a fraction or a mixed number by a whole number, invert the divisor and multiply.*

Divide. Check by going over the work:

| | | | | | |
|---|---|---|---|---|---|
| 3. | $\frac{1}{4} \div 4$ | $\frac{4}{5} \div 8$ | $7\frac{1}{5} \div 8$ | $3\frac{3}{4} \div 3$ | $6\frac{1}{4} \div 10$ |
| 4. | $\frac{3}{8} \div 6$ | $\frac{3}{4} \div 9$ | $1\frac{7}{8} \div 2$ | $1\frac{1}{8} \div 6$ | $1\frac{4}{5} \div 18$ |
| 5. | $\frac{5}{8} \div 2$ | $\frac{9}{16} \div 6$ | $2\frac{2}{3} \div 4$ | $2\frac{1}{4} \div 6$ | $1\frac{7}{8} \div 10$ |
| 6. | $\frac{9}{10} \div 6$ | $\frac{3}{10} \div 3$ | $4\frac{1}{8} \div 3$ | $2\frac{7}{16} \div 3$ | $8\frac{1}{4} \div 12$ |
| 7. | $\frac{2}{3} \div 8$ | $\frac{3}{5} \div 6$ | $2\frac{1}{3} \div 4$ | $2\frac{5}{8} \div 6$ | $2\frac{1}{3} \div 14$ |
| 8. | $\frac{3}{4} \div 6$ | $\frac{1}{2} \div 3$ | $2\frac{5}{8} \div 2$ | $2\frac{1}{4} \div 2$ | $5\frac{1}{4} \div 14$ |
| 9. | $\frac{7}{8} \div 2$ | $\frac{15}{16} \div 5$ | $2\frac{1}{2} \div 4$ | $5\frac{5}{6} \div 7$ | $6\frac{2}{3} \div 10$ |



1. Miss Allen gives music lessons. Each lesson is $\frac{1}{2}$ hr. long. How many lessons can she give in $3\frac{1}{2}$ hr.?

2. Mrs. West sold 3 chickens that together weighed $10\frac{1}{2}$ lb. Find the average weight per chicken.

3. On Saturdays the tennis court on the village playground is open from 10 A.M. until 5:30 P.M. Groups can sign up to use the court for $\frac{3}{4}$ hr. each. How many groups can use the court on Saturday?

4. Ann has $1\frac{1}{2}$ yd. of ribbon. How many badges each $\frac{1}{8}$ yd. long can she make from it?

5. A case containing 12 cans of plums weighs 18 lb. The case alone weighs $1\frac{1}{2}$ lb. Find the weight of each can.

6. Mary made 6 lb. of candy which she put in small bags to give to her friends at her party. She put $\frac{3}{8}$ lb. of candy in each bag. How many bags did she fill?

Divide. Check by going over the work:

| | | | | | |
|---|---|---|---|---|---|
| 7. | $4 \div \frac{3}{5}$ | $\frac{3}{4} \div 6$ | $2\frac{2}{3} \div 2$ | $5\frac{1}{3} \div \frac{1}{2}$ | $6\frac{2}{3} \div 5$ |
| 8. | $\frac{3}{5} \div 4$ | $\frac{1}{4} \div \frac{1}{5}$ | $9 \div \frac{3}{4}$ | $\frac{1}{12} \div \frac{1}{8}$ | $4 \div \frac{2}{5}$ |
| 9. | $\frac{3}{4} \div \frac{5}{8}$ | $\frac{5}{16} \div \frac{5}{6}$ | $5\frac{1}{2} \div \frac{3}{5}$ | $7 \div \frac{3}{4}$ | $4\frac{1}{3} \div \frac{3}{8}$ |
| 10. | $2 \div \frac{3}{4}$ | $\frac{7}{12} \div \frac{1}{2}$ | $7\frac{1}{5} \div 6$ | $3 \div \frac{4}{5}$ | $1\frac{3}{5} \div 12$ |
| 11. | $1\frac{7}{8} \div 3$ | $2\frac{2}{5} \div 3$ | $4\frac{2}{3} \div \frac{2}{3}$ | $\frac{3}{8} \div 2$ | $6\frac{1}{2} \div \frac{2}{3}$ |
| 12. | $\frac{1}{6} \div \frac{1}{10}$ | $\frac{11}{16} \div \frac{1}{4}$ | $3\frac{1}{4} \div 2$ | $\frac{7}{8} \div \frac{2}{3}$ | $2\frac{3}{5} \div 2$ |
| 13. | $\frac{9}{10} \div 10$ | $7 \div \frac{1}{2}$ | $4 \div \frac{5}{6}$ | $8\frac{1}{4} \div 6$ | $5\frac{3}{5} \div \frac{7}{10}$ |
| 14. | $3 \div \frac{1}{6}$ | $4\frac{1}{2} \div \frac{5}{8}$ | $\frac{7}{12} \div 7$ | $\frac{5}{12} \div \frac{1}{3}$ | $2\frac{3}{16} \div \frac{5}{12}$ |
| 15. | $1\frac{1}{8} \div 5$ | $\frac{1}{6} \div \frac{1}{8}$ | $5 \div \frac{2}{3}$ | $\frac{2}{3} \div \frac{5}{6}$ | $1\frac{4}{5} \div 6$ |
| 16. | $\frac{9}{10} \div \frac{5}{8}$ | $15 \div \frac{3}{4}$ | $\frac{1}{3} \div \frac{2}{5}$ | $\frac{3}{4} \div \frac{1}{4}$ | $7\frac{1}{2} \div \frac{5}{6}$ |
| 17. | $18 \div \frac{3}{4}$ | $\frac{9}{16} \div 9$ | $\frac{3}{4} \div \frac{1}{10}$ | $1\frac{3}{4} \div 2$ | $2\frac{1}{10} \div \frac{3}{5}$ |
| 18. | $\frac{7}{8} \div 12$ | $\frac{7}{8} \div \frac{1}{6}$ | $\frac{1}{8} \div \frac{2}{3}$ | $21 \div \frac{3}{4}$ | $1\frac{4}{5} \div 9$ |
| 19. | $8 \div \frac{2}{3}$ | $\frac{3}{5} \div 6$ | $5 \div \frac{1}{2}$ | $8\frac{1}{6} \div 7$ | $2\frac{2}{3} \div 16$ |

1. Mrs. Day paid \$1.00 for $2\frac{1}{2}$ doz. plants for her garden. What was the cost of the plants per dozen?

Write \$1.00 as $\frac{\$1.00}{1}$ and $2\frac{1}{2}$ as $\frac{5}{2}$. Then invert the divisor and multiply. The plants cost \$.40 per dozen.

$$\$1.00 \div 2\tfrac{1}{2} = \frac{\$\cancel{1.00}^{\,.20}}{1} \times \frac{2}{\cancel{5}_{\,1}} = \$.40$$

*To divide by a mixed number, change the mixed number to an improper fraction; then invert the divisor and multiply.*

2. A bus driver takes $1\frac{1}{2}$ hr. to make a round trip from Mayfield to Westport and back. How many round trips can he make in $4\frac{1}{2}$ hr.?

Change the divisor $1\frac{1}{2}$ to $\frac{3}{2}$. Then invert $\frac{3}{2}$ and multiply.

3. Jack says he can check the answer to ex. 2 by doing the work another way. He changes both $1\frac{1}{2}$ hr. and $4\frac{1}{2}$ hr. to minutes so that he will have whole numbers to work with. How many minutes are $1\frac{1}{2}$ hr.? $4\frac{1}{2}$ hr.? Then he divides the minutes. Do the work Jack's way. Do you get the same answer as in ex. 2?

Divide. Check the work by going over it:

| | | | | |
|---|---|---|---|---|
| 4. | $16 \div 2\frac{2}{5}$ | $1 \div 1\frac{1}{2}$ | $10\frac{1}{2} \div 1\frac{1}{3}$ | \$1.50 ÷ 3[illegible] |
| 5. | $2\frac{5}{8} \div 1\frac{1}{6}$ | $\frac{2}{3} \div 2\frac{2}{3}$ | $7 \div 1\frac{3}{4}$ | \$2.25 ÷ 0[illegible] |
| 6. | $9 \div 3\frac{3}{4}$ | $10 \div 6\frac{2}{3}$ | $6\frac{1}{8} \div 1\frac{3}{4}$ | \$3.50 ÷ 1[illegible] |
| 7. | $12\frac{1}{2} \div 1\frac{1}{4}$ | $24 \div 2\frac{2}{3}$ | $\frac{11}{12} \div 3\frac{2}{3}$ | \$2.20 ÷ 8[illegible] |
| 8. | $\frac{4}{5} \div 1\frac{1}{5}$ | $11\frac{1}{4} \div 2\frac{5}{8}$ | $4 \div 4\frac{4}{5}$ | \$1.25 ÷ 1[illegible] |
| 9. | $20 \div 3\frac{1}{3}$ | $\frac{1}{2} \div 1\frac{2}{3}$ | $6\frac{1}{2} \div 1\frac{2}{3}$ | \$1.75 ÷ 8[illegible] |
| 10. | $8\frac{1}{4} \div 1\frac{1}{8}$ | $4 \div 1\frac{1}{2}$ | $\frac{7}{12} \div 1\frac{3}{4}$ | \$2.00 ÷ 0[illegible] |
| 11. | $7\frac{1}{2} \div 1\frac{1}{2}$ | $\frac{3}{8} \div 1\frac{1}{8}$ | $3\frac{3}{5} \div 2\frac{1}{4}$ | \$2.50 ÷ 4[illegible] |
| 12. | $6\frac{1}{4} \div 1\frac{1}{2}$ | $\frac{1}{5} \div 3\frac{1}{5}$ | $4\frac{1}{2} \div 7\frac{1}{5}$ | \$3.00 ÷ 7[illegible] |

## MAKING APRONS

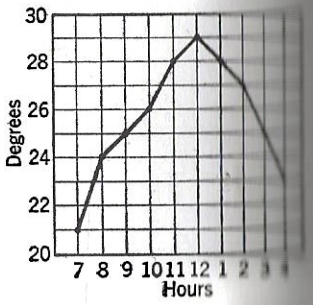
1. Mary is making aprons in the sewing class. She wants to make them for some of her friends. She bought 5 yd. of blue and white material and $7\frac{1}{2}$ yd. of green and white material. If each apron takes $1\frac{1}{4}$ yd., how many blue and white aprons can she make? how many green and white?

2. Mary trims the aprons with white braid. She uses $2\frac{2}{3}$ yd. of braid for each one. If there are 8 yd. of braid on each card, how many aprons can she trim with 1 card of braid?

Divide. Check the work by going over it:

| | | | |
|---|---|---|---|
| 3. [illegible] ÷ $1\frac{1}{4}$ | $1 \div 2\frac{2}{3}$ | $6\frac{2}{3} \div 2\frac{2}{3}$ | $\frac{3}{4} \div 1\frac{1}{3}$ |
| 4. [illegible] ÷ $1\frac{1}{5}$ | $\frac{15}{16} \div 5\frac{5}{8}$ | $3\frac{1}{3} \div 1\frac{1}{2}$ | $3 \div 1\frac{1}{4}$ |
| 5. [illegible] ÷ $3\frac{3}{5}$ | $4 \div 3\frac{3}{5}$ | $1\frac{3}{4} \div 1\frac{1}{6}$ | $\frac{1}{4} \div 2\frac{2}{3}$ |
| 6. [illegible] ÷ $1\frac{1}{4}$ | $\frac{3}{16} \div 1\frac{7}{8}$ | $25 \div 2\frac{1}{2}$ | $2 \div 1\frac{1}{3}$ |
| 7. [illegible] ÷ $4\frac{2}{3}$ | $\frac{11}{16} \div 8\frac{1}{4}$ | $5\frac{1}{2} \div 2\frac{3}{4}$ | $\frac{1}{5} \div 1\frac{1}{2}$ |
| 8. [illegible] ÷ $1\frac{1}{2}$ | $5 \div 2\frac{1}{2}$ | $9\frac{1}{3} \div 1\frac{1}{3}$ | $\frac{3}{8} \div 4\frac{1}{2}$ |

1. On page 52 you learned to make a line graph to show the progress of your scores on Improvement Tests. A *line graph* is often used to show how the temperature changes from hour to hour during the day. The graph at the right is a line graph. You see two scales on the graph, the *vertical* scale marked in *degrees of temperature* and the *horizontal* scale marked in *hours of the day*. In reading a line graph you need to watch both scales.




2. At 7 A.M. the temperature was 21°. You see a dot on the vertical line above 7 and on the horizontal line for 21. At 8 A.M. the temperature was 24°. From the graph tell the temperature for each of the other hours of the day to 4 P.M.

3. At what hour was the temperature highest? At what hour was it lowest?

Draw line graphs to show these temperatures:

4.

| Hours | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Degrees | 52 | 53 | 56 | 59 | 60 | 65 | 66 | 66 | 65 | 61 | 59 | 54 |

5.

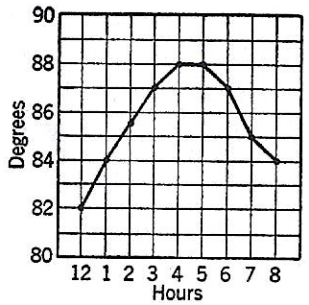
| Hours | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Degrees | 72 | 75 | 75 | 76 | 80 | 82 | 84 | 85 | 84 | 83 | 80 | 75 |

6.

| Hours | 9 | 10 | 11 | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Degrees | 58 | 60 | 63 | 65 | 66 | 65 | 64 | 62 | 60 | 59 | 54 | 50 |

7. On the graphs you drew for ex. 4–6, tell at what hours the temperature was highest and lowest. Between what hours, if any, did the temperature remain the same?






1. On this line graph what is the temperature at 12 M.? at 1 P.M.? at 3 P.M.? at 4 P.M.? at 5 P.M.? at 6 P.M.? at 7 P.M.? at 8 P.M.?

2. At 2 P.M. the temperature is halfway between 85° and 86°. What temperature is that?

3. What are the highest temperatures shown on the graph and at what hours did they occur? What is the lowest temperature on the graph and when did it occur?

4. Where would 12:30 P.M. be on the horizontal scale? What was the temperature at 12:30 P.M.? What was the temperature at 3:30? at 4:30? at 6:30? at 7:30?

Draw line graphs to show these temperatures:

5.

| Hour | 10 | 11 | 12 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Degrees | 60 | $63\frac{1}{2}$ | 65 | 65 | 67 | 71 | $72\frac{1}{2}$ | 72 | 67 | 65 | 59 |

From your graph read the temperature at 12:30; at 1:30; at 6:30.

6.

| Hour | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Degrees | 30 | 32 | 35 | 38 | 42 | 48 | 47 | 46 | 44 | $41\frac{1}{2}$ | 37 |

Study the graph and answer these questions:

(a) At what two hours of the day was the temperature 45°?
(b) At what hour was the temperature $33\frac{1}{2}$°? $36\frac{1}{2}$°?
(c) What was the temperature at 7:30? at 10:30?

7. Read a thermometer each hour from 9 A.M. to 4 P.M. and make a graph showing your readings.

# WHICH WAY IS EASIER?

Some problems can be solved in more than one way. Study the two methods of working ex. 1:

1. Joe wants to buy 5 tennis balls. He can buy Blue Star tennis balls at $.30 each or Monarch tennis balls at $.43 each. How much does Joe save if he buys 5 Blue Star balls?

FIRST SOLUTION

(1) 5 Blue Star tennis balls cost 5 × $.30, or $1.50.
(2) 5 Monarch tennis balls cost 5 × $.43, or $2.15.
(3) On 5 balls Joe saves $2.15 − $1.50, or $.65.

SECOND SOLUTION

(1) On 1 ball Joe saves $.43 − $.30, or $.13.
(2) On 5 balls Joe saves 5 × $.13, or $.65.

The first solution to ex. 1 has three steps while the second solution has two steps. You can save a little time by using the second solution but if you think the first one is easier, you may use that.

2. A fast train travels 45 mi. an hour. A slow train travels 32 mi. an hour. In 3 hr. how much farther can the fast train go than the slow train?

3. Mr. Smith earns $125 a month and spends $105 a month. How much does he save in 6 mo.?

4. Mrs. Day saw two kinds of dress material she liked. One cost $.79 a yard and the other cost $.98 a yard. If she needs 4 yd. of material, how much more will one kind cost than the other?

5. At the Sports Shop, Bill can buy tennis balls at $6.00 a dozen and another kind at $4.80 a dozen. Find the difference in the price per ball.

6. Mrs. Brown bought 5 cans of plums and 4 cans of pears. Both the plums and the pears cost 23¢ a can. How much did she pay all together?

7. Mary can walk at the rate of 3 mi. an hour. When she rides her bicycle she can go 7 mi. an hour. In 2 hr. how much farther can Mary go by bicycle than by walking?

8. Betty can buy a box of 3 small handkerchiefs for $.99 or a box of 3 large handkerchiefs for $1.29. At these prices, how much more does one of the large handkerchiefs cost than one of the small ones?

9. Tickets to the school play sell at $.35 each. Tom sold 28 tickets and Dick sold 43 tickets. How much money did both boys get for the tickets they sold?

10. Peggy can make aprons at a cost of $.48 each. She can sell these aprons at $.75 each. How much money can Peggy make on 6 aprons?

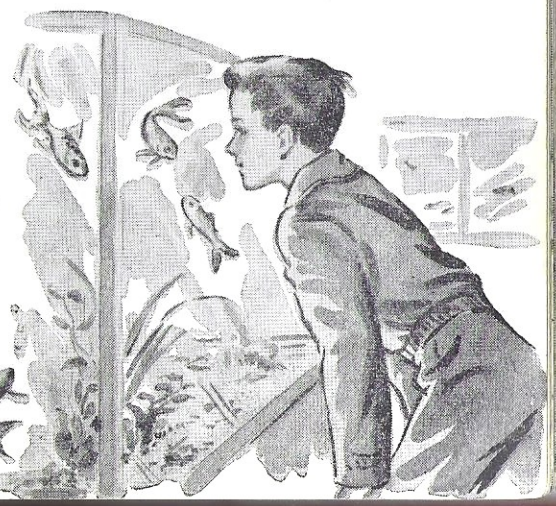
11. Alice saved $4.50 in 10 weeks and Jane saved $5.20 in 10 weeks. Find the difference between the average weekly savings of Alice and Jane.

12. How much must Henry pay for 75 two-cent stamps and 75 three-cent stamps?

13. Joe is making Easter cards. It takes him 25 min. each to make large Easter cards and 20 min. each to make small ones. If he makes 10 cards of each kind, how much longer will it take to make the large cards than the small ones?

14. Mr. and Mrs. Clark gave each of their 4 boys the same things for Christmas. They gave each boy a fountain pen that cost $3.75 and a five-dollar bill. How much did the presents for the 4 boys cost?

15. George wants to buy 4 goldfish of the same kind. He can get one kind at $.25 each and some others at $.44 each. How much more will George have to pay for 4 of one kind than for 4 of the others?



Write these decimals as fractions:

1. .09 .8 .001 .383 .017 .16 .8

Which decimal is larger?

2. .36 or .3 .28 or .3 .6 or .583 .72 or .253

3. Is the approximate answer to 6 × 1.02 about 6 or about 60? Is the approximate answer to .9 × 4.4 about 4 or about 40? Is the approximate answer to 1.5 × 10.02 about 15 or about 150?

Copy in columns, add, and check:

4. 6.3 + 4.6 + 9.1 + 3.4 + 8.0 + 6.5 + 1.3
5. .27 + .38 + .42 + .16 + .94 + .72 + .25
6. 1.42 + 4.66 + 7.94 + .38 + 2.84 + 6.75
7. 4.381 + 9.043 + 4.666 + 2.375 + 1.929
8. 1.5 + 2.75 + 3.375 + 4.25 + 6.5 + 9.125

Copy in columns, subtract, and check:

9. 6.8 − 3.6 1.5 − .625 9 − 3.2 5 − 4.16
10. 9.5 − 4.9 36 − 9.75 6 − 2.8 8 − 5.28

Multiply. Check the work by going over it:

11. 18 × .06 = 1.08; .34 × 5 = 1.70; 1.61 × .3 = .483; 900 × 1.12 = 1008; .006 × 9 = .054; 126 × .012 = 1.512
12. 29 × 1.3 = 37.7; 1.6 × .8 = 1.28; .004 × 18 = .072; 46.7 × 1.3 = 60.71; 5.71 × .6 = 3.426; 83.6 × 4.5 = 376.2
13. 47 × .17 = 7.99; .04 × 1.6 = .064; 9.36 × 1.1 = 10.296; 150 × 3.2 = 480; .007 × 3 = .021; .014 × 9 = .126
14. 36 × 2.5 = 90; 6.7 × .42 = 2.814; 528 × .05 = 26.4; .017 × 5 = .085; 31.2 × .04 = 1.248; .002 × .89 = .00178



| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 51 | 52 | 47 | 60 | 61 | 56 | 15 | 16 | 11 |
| 46 | 50 | 54 | 55 | 59 | 63 | 10 | 14 | 18 |
| 53 | 48 | 49 | 62 | 57 | 58 | 17 | 12 | 13 |
| 6 | 7 | 2 | 42 | 43 | 38 | 78 | 79 | 74 |
| 1 | 5 | 9 | 37 | 41 | 45 | 73 | 77 | 81 |
| 8 | 3 | 4 | 44 | 39 | 40 | 80 | 75 | 76 |
| 69 | 70 | 65 | 24 | 25 | 20 | 33 | 34 | 29 |
| 64 | 68 | 72 | 19 | 23 | 27 | 28 | 32 | 36 |
| 71 | 66 | 67 | 26 | 21 | 22 | 35 | 30 | 31 |

1. This large magic square has 9 numbers in each row and each column. How many like sums should there be? Add all the rows, columns, and diagonals to see that you get the same sum each time. How much is each sum?

2. This large magic square contains 9 small squares marked off with heavy lines. Check each of these small squares to see whether it is a magic square.

3. In the small square in the upper left-hand corner of the large square the sum of each row and each column is 150; in the small square below it, the sum is 15. Draw a square as shown at the right. Then write in the boxes the sums found in the 9 small squares. Do you get a magic square?

| | | |
|---|---|---|
| 150 | | |
| 15 | | |
| | | |

1. Jack bought 10 lb. of dog food. He feeds his dog $\frac{1}{2}$ lb. of it a day. How long will the 10 lb. last?

2. Bill walked to Newtown, a distance of $3\frac{3}{4}$ mi., in 1 hr. 15 min. How many minutes on the average did it take him to walk a mile? Change 1 hr. 15 min. to minutes.

3. Mr. Thomas bought $3\frac{1}{2}$ lb. of candy to be divided equally among his 4 grandchildren. What part of a pound of candy should each of the children get?

4. Tom sent a letter weighing $1\frac{1}{2}$ oz. to his cousin who lives in the Hawaiian Islands. Air mail to those islands costs 15¢ for each $\frac{1}{2}$ oz. How much did it cost Tom to send the letter by air mail?

Divide. Cancel when possible. Check the work by going over it.

| | | | | |
|---|---|---|---|---|
| 5. | $6 \div \frac{3}{4}$ | $1\frac{1}{3} \div 2$ | $\frac{1}{4} \div \frac{1}{3}$ | $\frac{3}{4} \div 1\frac{1}{2}$ |
| 6. | $3\frac{1}{2} \div \frac{1}{2}$ | $\frac{2}{3} \div \frac{4}{5}$ | $1\frac{5}{16} \div 3$ | $7 \div \frac{7}{8}$ |
| 7. | $\frac{1}{4} \div \frac{9}{16}$ | $2\frac{3}{4} \div \frac{1}{6}$ | $5 \div \frac{3}{5}$ | $5\frac{1}{4} \div 3$ |
| 8. | $\frac{1}{3} \div 2$ | $14 \div 1\frac{1}{2}$ | $4\frac{7}{8} \div 1\frac{1}{8}$ | $6 \div \frac{2}{3}$ |
| 9. | $1\frac{7}{8} \div 15$ | $\frac{1}{5} \div 2$ | $\frac{2}{3} \div \frac{7}{8}$ | $\frac{2}{3} \div 1\frac{1}{3}$ |
| 10. | $4 \div 3\frac{1}{3}$ | $1\frac{1}{3} \div 8$ | $3\frac{1}{2} \div \frac{7}{8}$ | $10\frac{2}{3} \div 1\frac{1}{3}$ |
| 11. | $1\frac{1}{2} \div 3\frac{3}{4}$ | $8 \div \frac{1}{3}$ | $\frac{3}{8} \div 4$ | $\frac{3}{4} \div \frac{3}{8}$ |
| 12. | $\frac{5}{6} \div 5$ | $2\frac{1}{2} \div 1\frac{1}{2}$ | $\frac{2}{3} \div 1\frac{1}{3}$ | $\frac{1}{4} \div 3$ |
| 13. | $2 \div \frac{4}{5}$ | $1\frac{1}{5} \div 2$ | $3\frac{3}{8} \div 1\frac{1}{2}$ | $6 \div 1\frac{1}{2}$ |
| 14. | $\frac{1}{2} \div \frac{9}{16}$ | $\frac{9}{16} \div 3$ | $8 \div 2\frac{1}{2}$ | $3\frac{3}{8} \div \frac{3}{4}$ |
| 15. | $\frac{2}{3} \div 1\frac{2}{5}$ | $\frac{4}{5} \div \frac{1}{10}$ | $2\frac{1}{2} \div \frac{5}{8}$ | $6\frac{1}{4} \div 1\frac{1}{2}$ |
| 16. | $4\frac{1}{2} \div 2$ | $15 \div 7\frac{1}{2}$ | $\frac{3}{8} \div \frac{1}{16}$ | $8\frac{1}{4} \div 3$ |
| 17. | $2\frac{3}{4} \div \frac{5}{8}$ | $1\frac{1}{4} \div 5$ | $5 \div 3\frac{1}{3}$ | $\frac{1}{2} \div 1\frac{1}{2}$ |
| 18. | $12 \div 1\frac{4}{5}$ | $3\frac{1}{2} \div \frac{7}{16}$ | $\frac{1}{4} \div 1\frac{1}{3}$ | $\frac{3}{8} \div \frac{3}{4}$ |
| 19. | $\frac{5}{8} \div 10$ | $10\frac{1}{2} \div 1\frac{1}{2}$ | $5\frac{2}{5} \div \frac{9}{10}$ | $8 \div 2\frac{1}{2}$ |



Multiplication Test 3a. Time: 5 min. after copying.

| | | | | | |
|---|---|---|---|---|---|
| 1. 417 / 549 | 963 / 628 | 564 / 207 | 485 / 364 | 329 / 519 | 625 / ⑥ 370 |

Multiplication Test 3b. Time: 5 min. after copying.

| | | | | | |
|---|---|---|---|---|---|
| 2. 684 / 502 | 371 / 843 | 618 / 792 | 794 / 375 | 593 / 428 | 478 / ⑥ 920 |

Multiplication Test 3c. Time: 5 min. after copying.

| | | | | | |
|---|---|---|---|---|---|
| 3. 468 / 486 | 527 / 567 | 849 / 504 | 382 / 831 | 372 / 369 | 195 / ⑥ 690 |

Division Test 3a. Time: 6 min. after copying.

| | | |
|---|---|---|
| 4. 34)25092 | 58)47502 | 16)15155 |
| 5. 25)19450 | 39)25077 | ⑥ 60)34087 |

Division Test 3b. Time: 6 min. after copying.

| | | |
|---|---|---|
| 6. 80)57840 | 26)17559 | 44)21912 |
| 7. 17)15079 | 61)36170 | ⑥ 47)17766 |

Division Test 3c. Time: 6 min. after copying.

| | | |
|---|---|---|
| 8. 18)13662 | 70)17010 | 52)27529 |
| 9. 29)17954 | 33)15444 | ⑥ 38)14896 |

Improvement Tests. In ex. 4–9, write R before remainders.

1. When Mary was born she weighed 8 lb. Now she weighs 72 lb. Mary's present weight is how many times as great as her weight when born?

2. Mary is 12 yr. old. Her little sister is 4 yr. old. Mary is how many times as old as her sister?

3. George saved $50 last year and Bill saved $25. George saved how many times as much as Bill?

4. In the Madison elementary schools there are 1920 pupils. In the Madison high school there are 428 pupils. The elementary pupils are how many times as many as the high school pupils?

5. The elephant in the zoo weighs 8241 lb. Jim weighs 67 lb. The elephant is how many times as heavy as Jim?

6. The flagpole on the school playground is 85 ft. high. Jim is 5 ft. tall. The flagpole is how many times as high as Jim?

7. Ann lives only 48 mi. from Chicago but it is 960 mi. from Ann's home to New York. New York is how many times as far away as Chicago?

Find the number to put in each space:

8. 1500 mi. is . . . times as far as 250 mi.
9. 2000 lb. is . . . times as heavy as 80 lb.
10. $22,400 is . . . times as large as $35.
11. 5280 ft. is . . . times as long as 660 ft.
12. 144 doz. is . . . times as many as 24 doz.
13. $75,000 is . . . times as large as $125.

> To find how many times as large one number is as another, divide the larger number by the smaller.



1. The girls in the cooking class learned to make muffins yesterday. They found that they could make 12 muffins from one recipe at a total cost of $.19. Tomorrow they will make 96 muffins to serve in the school lunchroom. What will be the cost of these muffins?

Since 96 muffins is 8 times as many as 12 muffins, the girls must make 8 times as many muffins to have 96 in all. If it cost $.19 to make 12 muffins, it will cost 8 × $.19 to make 96 muffins. How much is 8 × $.19?

2. In the lunchroom the girls sell 2 muffins for 5¢. For how much will they sell 96 muffins?

96 is how many times as large as 2?

3. Last week the girls in the cooking class made 180 oatmeal cookies. The recipe the girls used calls for 2 eggs to make 36 cookies. How many eggs did they use for 180 cookies?

4. The recipe also calls for 2 oz. of butter for 36 cookies. How many ounces of butter did they use for 180 cookies?

5. The lunchroom buys 1 gal. of milk, or 16 glasses, for 50¢. If they serve 224 glasses of milk for lunch, how much must they pay for the milk?

1. Mr. Day has a store where he sells flowers. At Easter he had 84 pots of Easter lilies to sell. He sold 28 of these to a church. What part of the 84 pots did he sell to a church?

28 is $\frac{28}{84}$ of 84. Reducing $\frac{28}{84}$ to lowest terms, you get $\frac{1}{3}$, so $\frac{1}{3}$ of the 84 pots of lilies were sold to a church.

2. Mr. Day sold 14 pots of Easter lilies to the Choral Society to decorate the hall for an Easter concert. What part of the 84 pots did he sell to the Choral Society?

3. Mr. Day sold the rest of the Easter lilies to people who came to his store. How many pots of lilies did he sell in the store? What part of the 84 pots did he sell in the store?

4. Mr. Day sells roses by the dozen. At $3.00 a dozen, how much does he charge for 6 roses? for 9 roses? for 8 roses?

> To find what part one number is of a larger number, write the smaller number over the larger one to make a fraction. Reduce the fraction to lowest terms.

5. Joe delivers flowers for Mr. Day. Yesterday morning he delivered some flowers at Mrs. Smith's house. It took him 15 min. in all. What part of an hour is 15 min.? In the afternoon Joe delivered a plant at Mrs. Green's house. The trip took 45 min. What part of an hour is that?

6. There are 20 blocks to the mile in the city where Joe lives. Today he walked 10 blocks to deliver a plant; what part of a mile did he walk?

7. All together Mr. Day had 600 plants to sell at Easter time. Of this number only 25 plants were not sold. How many plants were sold? What part of the plants were sold? What part were not sold?

8. When Mr. Day sells a pot of tulips or daffodils he charges by the number of bulbs in the pot. He sells a small pot with 2 tulip bulbs for 65¢. What does he charge for a pot with 4 bulbs? for one with 6 bulbs?

9. He sold a pot with 2 daffodil bulbs for 75¢. How many bulbs were in a pot that sold for $2.25?

10. Mr. Day had 12 doz. cut daffodils to sell. How many cut daffodils in all did he have?

11. He sold the daffodils at 6 for 50¢. How much did he get for 144 daffodils?

12. Alice bought 3 daffodils for her mother. At 6 for 50¢, how much did 3 cost?

1. John paid 35¢ for $\frac{1}{2}$ lb. of candy. If he had bought 1 lb. of candy, what would it have cost?

In this problem you know the cost of $\frac{1}{2}$ lb. of candy, and want to find the cost of 1 *whole* pound. There are 2 *halves* in 1 whole. If $\frac{1}{2}$ lb. costs 35¢, 1 whole pound will cost $2 \times 35$¢, or 70¢.

2. Ann put \$2.75 in the savings bank. This was $\frac{1}{3}$ of the money she earned last month. How much money did Ann earn last month?

You must find the *whole* amount Ann earned last month.

3. Jack has saved \$9.50 for camp next summer. This amount is only $\frac{1}{4}$ of the money he needs to go to camp. How much money does Jack need for camp?

4. Ann bought $\frac{3}{4}$ yd. of ribbon for 15¢. How much will 1 yd. of ribbon cost?

$\frac{1}{4}$ yd. of ribbon costs $\frac{1}{3}$ as much as $\frac{3}{4}$ yd. $\frac{3}{4}$ yd. costs 15¢, so $\frac{1}{4}$ yd. costs $\frac{1}{3}$ of 15¢, or 5¢. 1 whole yard, or $\frac{4}{4}$ yd., will cost $4 \times 5$¢, or 20¢.

5. Tom bought a bicycle for \$18.80 because it was an old model. This was $\frac{2}{3}$ of the regular price of the bicycle. What was the regular price?

6. Mary paid 45¢ for a ticket to the art exhibit. She got it for $\frac{3}{4}$ of the regular price because she is a school pupil. What was the regular price of a ticket?

Tell what number should be put in each space:

| | | |
|---|---|---|
| 7. 9 is $\frac{1}{3}$ of . . . | 15 is $\frac{1}{2}$ of . . . | 60 is $\frac{1}{4}$ of . . . |
| 8. 5 is $\frac{1}{5}$ of . . . | 20 is $\frac{1}{8}$ of . . . | 12 is $\frac{1}{6}$ of . . . |
| 9. 6 is $\frac{2}{3}$ of . . . | 18 is $\frac{3}{8}$ of . . . | 55 is $\frac{5}{8}$ of . . . |
| 10. 9 is $\frac{3}{4}$ of . . . | 49 is $\frac{7}{8}$ of . . . | 72 is $\frac{3}{5}$ of . . . |
| 11. 4 is $\frac{1}{6}$ of . . . | 75 is $\frac{5}{6}$ of . . . | 48 is $\frac{3}{8}$ of . . . |
| 12. 8 is $\frac{4}{5}$ of . . . | 60 is $\frac{3}{4}$ of . . . | 25 is $\frac{5}{8}$ of . . . |



| Subtract | Multiply | Divide | Add |
|---|---|---|---|
| 1. \$62.80<br>53.79 | 2. 43.09<br>9.5 | 3. 33)528 | 4. 2.48<br>7.73<br>9.56<br>3.75<br>1.69<br>6.08 |

| Add | Subtract | Multiply |
|---|---|---|
| 5. $6\frac{5}{12}$<br>$3\frac{11}{12}$ | 6. $8\frac{1}{2}$<br>$4\frac{2}{3}$ | 7. $7\frac{1}{2} \times 2\frac{2}{3}$ |

Study each exercise carefully. Then work it:

8. Divide 2355 by 8; write the remainder as a fraction in the quotient.

9. Find the average of 48, 81, 35, 69, 56, 17.

10. Find the difference between 8423 and 1695.

11. 285 is how many times as large as 15? 18 is how many times as large as $\frac{1}{2}$? $10\frac{1}{2}$ is how many times as large as $1\frac{1}{2}$?

12. What part of 12 is 9? What part of 56 is 28? What part of 96 is 60? What part of 22 is 6?

13. 72 is $\frac{1}{2}$ of what number? 24 is $\frac{2}{3}$ of what number? 100 is $\frac{5}{8}$ of what number?

14. Add $3\frac{1}{10}$, $2\frac{1}{2}$, and $4\frac{1}{5}$. Then subtract the sum from 15.

15. Multiply $\frac{3}{4}$ by $2\frac{2}{3}$. Multiply $1\frac{7}{8}$ by $\frac{4}{5}$.

16. Round off each number to the nearest thousand: 1973, 3164, 5827.

17. On a map the scale is $\frac{1}{4}$ in. = 1 mi. How many miles are represented by a line $3\frac{3}{4}$ in. long?

18. Which decimal is larger, .301 or .8? How much larger? Which is larger, $\frac{2}{5}$ or .45? how much larger?

19. Multiply 125 by .002; by .02; by .2.

20. Which of these numbers is the most reasonable answer for $9 \times .16$? 144, 14.4, 1.44, .144.

In the problems on this page some numbers are given that are not needed in finding the answer. Tell which numbers are not needed and then work the problem:

1. Jim bought a pad of 50 sheets of typewriter paper for 29¢. He also bought 6 pencils for 15¢. How much change did Jim get from 50¢?

2. Ned, Bill, and Dick went fishing. They rented a boat for 3 hr. at 35¢ an hour. The boys caught 8 fish in all. If they divided the cost of the boat equally, how much did each boy pay?

3. It is 45 mi. to Johnson City by the new road. The old road is 6 mi. longer. At an average speed of 30 mi. an hour, how many hours does Mr. Brown need to drive to Johnson City by the new road?

4. Henry's rate of walking is usually 3 mi. per hour. One day he walked $6\frac{1}{2}$ mi. in 2 hr. What was his average rate per hour that day?

5. Mary's mother will be 35 yr. old on June 1. Mary wants to buy her 6 handkerchiefs for a present. She saw some handkerchiefs at 3 for $1.00. How much must Mary pay for 6 handkerchiefs of this kind?

6. Last winter eggs sometimes cost 75¢ a dozen. Now there are more eggs and the price is 52¢ a dozen. How much must Mrs. Day pay for $1\frac{1}{2}$ doz. eggs now? How much must she pay for $2\frac{1}{2}$ doz. eggs now?

7. Ann earned 25¢ and her father gave her 25¢. She wants to buy 6 pencils that sell at 2 pencils for 5¢. How much will 6 pencils cost?

8. Mrs. Dean bought 3 spools of white thread at 5¢ each and 2 spools of black thread at 9¢ each. There were 125 yd. of thread on each spool of white thread and 250 yd. of thread on each spool of black thread. How much did Mrs. Dean pay for the thread?



1. Which has the larger area, a square 12 ft. on a side or a rectangle 15 ft. long and 9 ft. wide? How much larger is it?

2. What part of a pound is 12 oz.? 14 oz.?

3. Find the cost of a piece of meat weighing 3 lb. 12 oz. at $.50 a pound.

4. Miss West charges $1.50 for giving a music lesson 45 min. long. At this rate what does she charge per hour?

5. Mr. Hill has a 5-ton truck which means that it will carry a load of 5 tons. How many boxes each weighing 125 lb. can the truck carry?

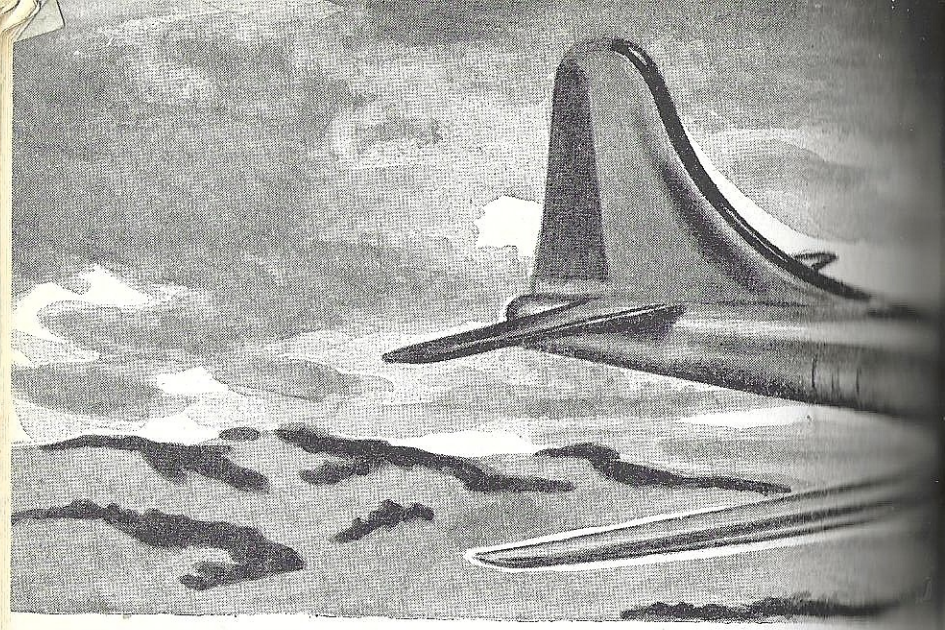
6. How many yards of ribbon does Mrs. Cross need to bind a baby blanket 30 in. wide and 40 in. long? She allows 1 in. extra to turn each corner.

7. Joe pays 5¢ for a candy bar that weighs $1\frac{3}{4}$ oz. How many of these bars should Joe buy if he wants about 1 lb. of candy? Give your answer to the nearest whole bar. Do these bars together weigh just a pound, or a little more than a pound, or a little less than a pound? What is the cost of these bars together?

8. How many 8-ounce boxes can be filled with $4\frac{1}{2}$ lb. of candy? Will any candy be left over?

What number goes in each space?

| | | | |
|---|---|---|---|
| 9. | $\frac{3}{4}$ lb. = .. oz. | 10 oz. = .. lb. | 10 in. = .. ft. |
| 10. | $\frac{1}{2}$ mi. = .. ft. | 15 in. = .. ft. | 48 oz. = .. lb. |
| 11. | $\frac{3}{4}$ yd. = .. in. | 20 ft. = .. yd. | $1\frac{1}{2}$ lb. = .. oz. |
| 12. | $\frac{3}{4}$ hr. = .. min. | $5\frac{1}{3}$ ft. = .. in. | $3\frac{1}{2}$ hr. = .. min. |
| 13. | 1 hr. = .. sec. | 60 in. = .. ft. | $1\frac{1}{4}$ min. = .. sec. |
| 14. | $\frac{1}{2}$ ft. = .. in. | 12 ft. = .. yd. | $2\frac{1}{2}$ gal. = .. qt. |
| 15. | $\frac{1}{2}$ bu. = .. qt. | $1\frac{1}{2}$ yd. = .. in. | 50 min. = .. hr. |
| 16. | $\frac{3}{4}$ yd. = .. in. | $1\frac{1}{4}$ mi. = .. ft. | $1\frac{1}{2}$ ton = .. lb. |



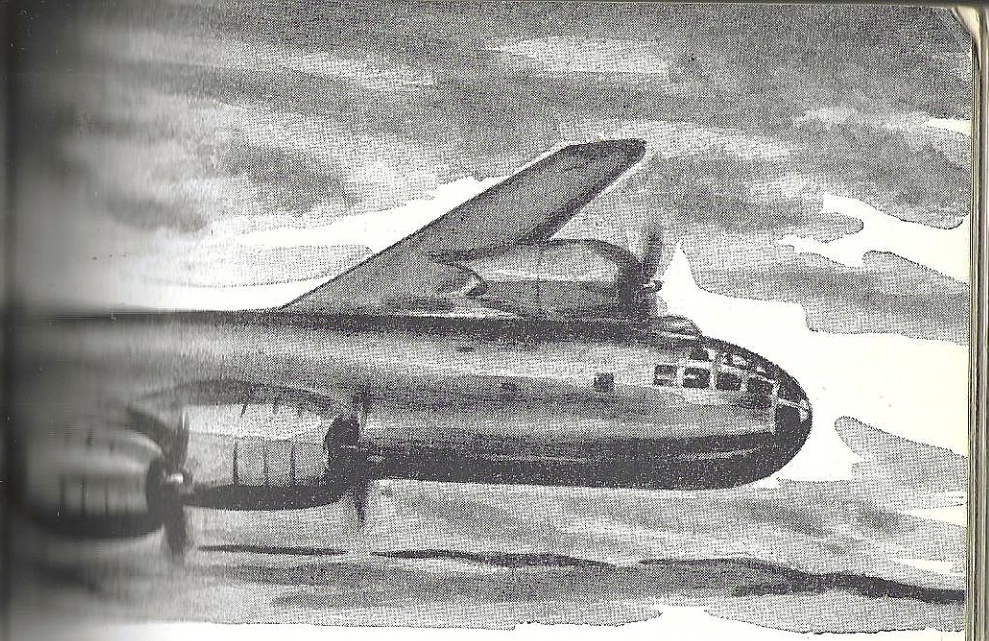
## HOW FAST CAN IT FLY?

1. Suppose an airplane flies 1982 mi. in 7 hr. and that you are asked to find its speed per hour, the answer to be correct to the *nearest whole mile.* When you divide 1982 by 7, you get $283\frac{1}{7}$, which is called 283 to the nearest whole mile because $\frac{1}{7}$ is less than $\frac{1}{2}$. If the answer were $283\frac{5}{7}$, it would be called 284 mi. to the nearest whole mile because $\frac{5}{7}$ is more than $\frac{1}{2}$. What would you call $283\frac{1}{2}$ to the nearest whole mile?

*In finding an answer to the nearest whole number, a fraction less than $\frac{1}{2}$ is dropped while a fraction equal to or greater than $\frac{1}{2}$ is counted as another whole unit.*

2. Each year faster and better airplanes are being built which make it possible gradually to reduce the time necessary to make a given trip such as flying across our country from California to the Atlantic Coast. In 1925 a non-stop flight from Los Angeles to New York took 26 hr. 50 min. to cover the distance of 2464 mi. How many miles per hour, to the nearest whole mile, were covered on that trip? Before dividing, change 26 hr. 50 min. to $26\frac{5}{6}$ hr.





3. In 1935 the time for the non-stop flight of 2464 mi. from Los Angeles to New York was reduced to 11 hr. 6 min. Find, to the nearest whole mile, the speed per hour on that trip. To what mixed number do you change 11 hr. 6 min.?

4. In 1945 the trip of 2464 mi. across our country was made in 5 hr. 28 min. on a non-stop flight. At what speed per hour, to the nearest whole mile, was that trip made?

5. Joe says he has a short way to get an *approximate* answer to ex. 4 by using 5 hr. 30 min. for the time instead of 5 hr. 28 min. He says he can do this because 28 min. is very close to 30 min. Then Joe divides 2464 by $5\frac{1}{2}$ which is easier than dividing by $5\frac{7}{15}$ as was done in ex. 4. Work the problem Joe's way. How does the approximate answer differ from the actual answer in ex. 4? Remember that an *approximate* answer is one that is close to the actual answer.

6. An Army airplane made a trip of 2451 mi. from Oakland, California, to Washington, D. C., in 6 hr. 59 min. Find, to the nearest whole mile, the *approximate* speed of this plane per hour. Using Joe's plan, to what time will you change 6 hr. 59 min. so that it will be easier to use?

1. A long-distance non-stop flying record was made in 1945 when a plane flew from Guam, an island in the Pacific Ocean, to Washington, D. C., in 35 hr. 5 min., covering a total distance of 8198 mi. Find, to the nearest whole mile, the average speed per hour of this plane.

2. On the long-distance flight described in ex. 1, the plane had 11,110 gal. of gasoline when it started the trip; at the end of the trip 300 gal. of gasoline were still in the tanks. How many gallons were used to cover the entire trip of 8198 mi.? Did the plane use about $1\frac{1}{4}$ gal. or $1\frac{1}{3}$ gal. of gasoline per mile on this trip? About how many miles beyond Washington, D. C., could the plane have flown on the 300 gal. of gasoline left in the tank?

3. On another long-distance non-stop flight, from Japan to Washington, D. C., a plane flew 6544 mi. in 27 hr. 29 min. Using Joe's plan, described in ex. 5 on page 189, change 27 hr. 29 min. to a time close to it and find, to the nearest whole mile, the approximate speed of this plane per hour.

4. In 1927 Charles Lindbergh made his famous non-stop flight across the Atlantic Ocean from New York to Paris, covering a total distance of 3647 mi. in $33\frac{1}{2}$ hr. Find, to the nearest whole mile, his average speed per hour.

5. In 1939 Howard Hughes flew from New York to Paris in $16\frac{1}{2}$ hr., covering a distance of 3641 mi. Find, to the nearest whole mile, his speed per hour. His speed was about how many times as fast as that of Lindbergh for the same trip? This trip by Hughes was the first lap of his trip around the world which is described in ex. 6.

6. In 1939 Howard Hughes made a record trip around the world, his total flying time being 71 hr. The total distance covered on this trip was 14,824 mi. How many miles per hour did Hughes average on this trip? Find the result to the nearest whole mile.



Add up. Check the work by adding down:

| | | | |
|---|---|---|---|
| 1. $83.98 | $23.06 | $33.23 | $96.15 |
| 42.52 | .95 | .66 | .98 |
| .65 | 95.97 | .23 | .91 |
| 84.06 | 78.47 | 25.91 | 38.67 |
| 49.50 | .39 | 7.30 | .65 |
| 1.47 | 88.71 | .28 | 7.06 |
| 44.27 | 24.90 | 25.72 | 57.10 |
| 1.59 | 3.18 | 31.47 | 56.85 |
| 2. $364.25 | $119.13 | $426.77 | $622.50 |
| 33.45 | 7.75 | 215.06 | 100.00 |
| 7.10 | 318.42 | 81.49 | 8.82 |
| 185.14 | 66.20 | 4.99 | 75.30 |
| 90.56 | 9.63 | 173.18 | 6.68 |
| 240.00 | 285.57 | 9.95 | 89.98 |
| 3. $436.60 | $956.65 | $889.28 | $554.70 |
| 714.83 | 3.38 | 271.62 | 64.21 |
| 4.49 | 469.80 | 91.54 | 92.79 |
| 79.80 | 57.86 | 910.70 | 227.29 |
| 235.73 | 563.00 | 6.07 | 8.01 |
| 61.95 | 1.49 | 8.88 | 85.96 |

Subtract. Check the work by adding:

| | | | |
|---|---|---|---|
| 4. $50.03 | $85.65 | $500.47 | $943.75 |
| 16.33 | 18.89 | 265.07 | 282.99 |
| 5. $51.54 | $70.88 | $765.87 | $300.00 |
| 36.56 | 28.89 | 356.79 | 157.84 |
| 6. $87.21 | $70.00 | $850.44 | $811.55 |
| 49.67 | 49.87 | 698.77 | 228.96 |
| 7. $60.00 | $93.43 | $880.00 | $862.27 |
| 17.04 | 76.56 | 400.17 | 584.89 |

Read each statement below. Then tell whether it is right or wrong by saying "yes" or "no:"

1. At 4 plums for 10¢, 20 plums cost 50¢.

2. When .12 is multiplied by .6, the product is .72.

3. A box weighing 12 lb. is 6 times as heavy as a box weighing $2\frac{1}{2}$ lb.

4. Jim has 220 stamps in one stamp book. This half of the stamps he owns. So Jim owns 110 stamps.

5. When a 6-inch piece of gummed paper is cut into $\frac{1}{2}$-inch lengths, there are 12 pieces.

6. When .08 is multiplied by 1.1 the product is .088.

7. At 12 pads for $1.00, 3 pads cost $.25.

8. To find what part 18 is of 72, divide 72 by 18. The answer is 4.

9. The area of a rectangle 6 ft. by $8\frac{1}{2}$ ft. is 51 sq. ft.

10. On a scale drawing $\frac{1}{2}$ in. stands for 1 mi. A line $3\frac{1}{4}$ in. long stands for $6\frac{1}{2}$ mi.

11. The Roman number MCMLX means 1940.

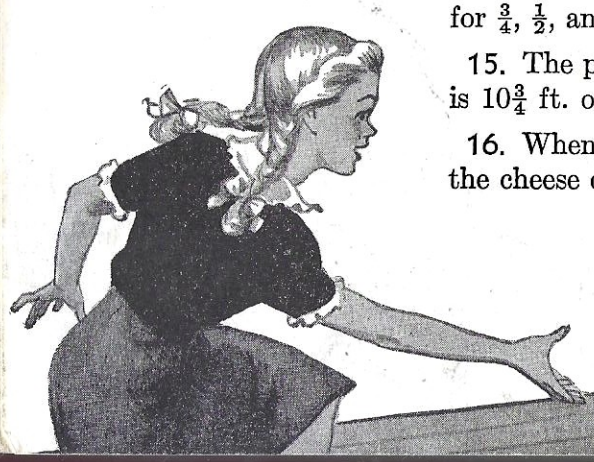
12. When 62,286,327 is rounded off to the nearest million it becomes 62,000,000.

13. $4\frac{5}{8}$ is a mixed decimal. 3.7 is a mixed number.

14. The least common denominator for $\frac{3}{4}$, $\frac{1}{2}$, and $\frac{5}{6}$ is 24.

15. The perimeter of a square that is $10\frac{3}{4}$ ft. on a side is 43 ft.

16. When $\frac{5}{8}$ lb. of cheese costs 35¢, the cheese costs 50¢ a pound.





1. In 1 hr. an airplane went 228 mi. while a car went only 38 mi. in the same time. How many times as fast as the car did the airplane go?

2. There are 36 pupils in Ann's class and 21 of them are girls. What part of the class is girls?

3. Find the price of 1 doz. eggs if Jack charged Mrs. White 78¢ for $1\frac{1}{2}$ doz.

4. In the last 4 weeks Jack's hens have laid these numbers of eggs: first week, $4\frac{1}{2}$ doz.; second week, 5 doz.; third week, $6\frac{1}{4}$ doz.; fourth week, $4\frac{1}{4}$ doz. Find the average number of dozen eggs laid per week.

5. How much change should you receive from a 10-dollar bill after purchasing $4\frac{1}{2}$ yd. of cloth at $1.65 a yard?

6. Mrs. Bates has a dress pattern that calls for $4\frac{1}{4}$ yd. of material. She has a piece of material $3\frac{3}{4}$ yd. in length. How much too short is this piece?

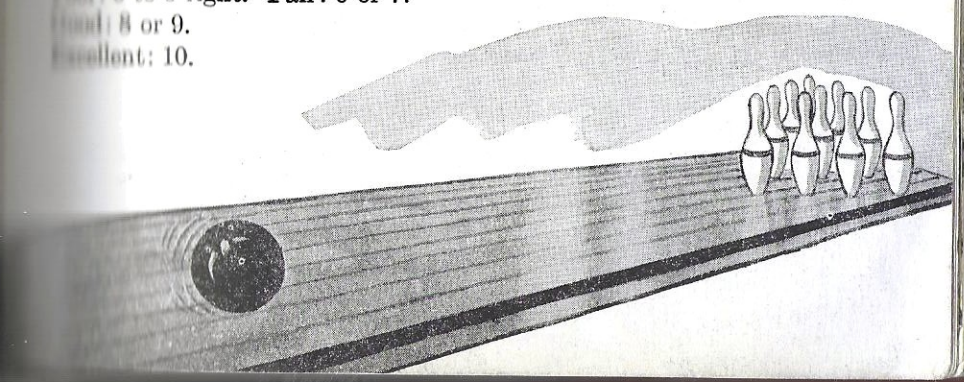
7. Henry can ride his bicycle at an average rate of 8 mi. per hour. What part of an hour will it take him to ride 6 mi.?

8. In making cocoa Betty uses 4 cups of milk for 6 cups of cocoa. If she wants to make 12 cups of cocoa, how many cups of milk should she use?

9. The girls want to make a badge for each of the 18 members of the Camera Club. Each badge is to be $4\frac{1}{2}$ in. long. How many yards of ribbon do they need?

10. Find the cost of 1 orange when 8 oranges cost 30¢.

Poor: 0 to 5 right. Fair: 6 or 7.
Good: 8 or 9.
Excellent: 10.



1. At 6 marbles for 10¢, how much will 30 marbles cost?

2. How much more will it cost to buy 4 handkerchiefs at 35¢ each than to buy 4 handkerchiefs at 29¢ each?

3. Peggy sleeps 9 hr. every night. What part of the whole day of 24 hr. does Peggy spend sleeping?

4. Ann paid 15¢ for $\frac{1}{4}$ yd. of ribbon. How much did the ribbon cost per yard?

5. Peter says that the overcoat he bought for $15.75 cost him only $\frac{3}{4}$ of the regular price. What was the regular price of the overcoat?

6. The baby elephant at the zoo weighs 250 lb. and its mother weighs 8000 lb. The mother elephant is how many times as heavy as the baby elephant?

7. Mr. Gates charges $4.50 for 12 large roses. At that price, how much does he charge for 4 roses?

Divide. Check by going over the work:

| | | | | |
|---|---|---|---|---|
| 8. | $6 \div \frac{3}{5}$ | $2\frac{5}{8} \div \frac{2}{3}$ | $6\frac{2}{3} \div 1\frac{2}{3}$ | $\frac{1}{3} \div$ [illegible] |
| 9. | $\frac{2}{3} \div 2$ | $1\frac{2}{3} \div 4$ | $28 \div 4\frac{1}{5}$ | $\frac{13}{16} \div$ [illegible] |
| 10. | $6 \div \frac{2}{3}$ | $27 \div \frac{3}{4}$ | $5\frac{2}{5} \div 2\frac{1}{4}$ | $\frac{1}{4} \div$ [illegible] |
| 11. | $\frac{3}{4} \div \frac{4}{5}$ | $3\frac{1}{3} \div \frac{5}{12}$ | $1\frac{1}{8} \div 1\frac{4}{5}$ | $9 \div$ [illegible] |
| 12. | $\frac{5}{8} \div \frac{1}{10}$ | $2\frac{3}{10} \div \frac{4}{5}$ | $2\frac{5}{8} \div 1\frac{3}{4}$ | $\frac{5}{8} \div$ [illegible] |
| 13. | $\frac{3}{4} \div 6$ | $1\frac{7}{8} \div 5$ | $1\frac{4}{5} \div 18$ | $7 \div$ [illegible] |
| 14. | $\frac{9}{16} \div \frac{3}{10}$ | $18 \div \frac{9}{10}$ | $18 \div 2\frac{2}{5}$ | $\frac{5}{8} \div$ [illegible] |
| 15. | $8 \div \frac{2}{5}$ | $7\frac{1}{2} \div \frac{5}{6}$ | $5\frac{3}{5} \div 2\frac{1}{10}$ | $\frac{3}{4} \div$ [illegible] |
| 16. | $\frac{1}{16} \div \frac{5}{16}$ | $8\frac{1}{4} \div 3$ | $1\frac{2}{3} \div 10$ | $2 \div$ [illegible] |
| 17. | $\frac{1}{4} \div \frac{3}{10}$ | $1\frac{7}{8} \div \frac{3}{8}$ | $18\frac{3}{4} \div 3\frac{3}{4}$ | $\frac{7}{8} \div$ [illegible] |
| 18. | $\frac{1}{8} \div \frac{5}{12}$ | $2\frac{1}{2} \div \frac{3}{4}$ | $3\frac{3}{8} \div 1\frac{1}{2}$ | $6 \div$ [illegible] |
| 19. | $\frac{3}{16} \div \frac{3}{10}$ | $3\frac{3}{4} \div \frac{2}{3}$ | $4\frac{1}{5} \div 3\frac{3}{10}$ | $\frac{3}{4} \div$ [illegible] |



If you miss more than one example in any row, turn to the Practice Pages for that row:

Divide. Check by going over the work:

| | | | | PRACTICE PAGES |
|---|---|---|---|---|
| 1. | $9 \div \frac{1}{3}$ | $10 \div \frac{1}{5}$ | $12 \div \frac{1}{2}$ | 160 |
| 2. | $3 \div \frac{5}{8}$ | $12 \div \frac{2}{3}$ | $10 \div \frac{4}{5}$ | 161 |
| 3. | $\frac{3}{5} \div \frac{1}{10}$ | $\frac{3}{8} \div \frac{1}{6}$ | $\frac{9}{16} \div \frac{3}{8}$ | 162, 163 |
| 4. | $5\frac{1}{4} \div \frac{7}{8}$ | $1\frac{1}{6} \div \frac{2}{3}$ | $2\frac{1}{2} \div \frac{2}{5}$ | 162, 163 |
| 5. | $\frac{8}{9} \div 2$ | $\frac{9}{10} \div 3$ | $\frac{2}{5} \div 4$ | 168 |
| 6. | $1\frac{1}{9} \div 8$ | $5\frac{2}{5} \div 9$ | $2\frac{1}{4} \div 9$ | 168 |
| 7. | $3 \div 1\frac{4}{5}$ | $8 \div 1\frac{1}{2}$ | $10 \div 4\frac{1}{6}$ | 170, 171 |
| 8. | $7\frac{1}{9} \div 3\frac{1}{3}$ | $9\frac{3}{4} \div 3\frac{1}{4}$ | $3\frac{1}{4} \div 1\frac{1}{3}$ | 170, 171 |
| 9. | $\frac{1}{8} \div 5\frac{1}{3}$ | $\frac{1}{2} \div 2\frac{2}{3}$ | $\frac{5}{8} \div 4\frac{1}{6}$ | 170, 171 |

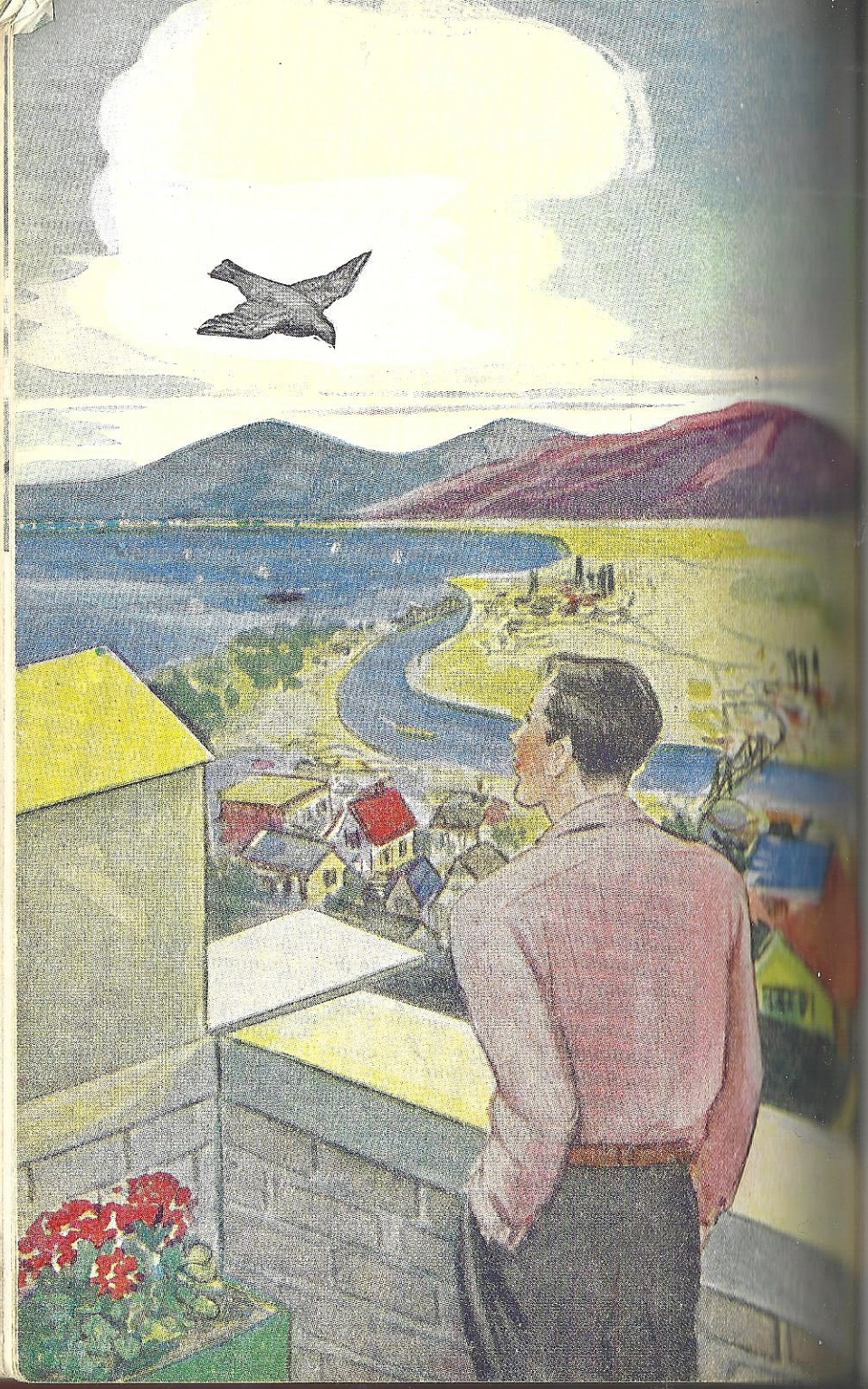
Find the number to put in each space:

| | | | | |
|---|---|---|---|---|
| 10. | 3 is $\frac{1}{5}$ of . . | 6 is $\frac{1}{2}$ of . . | 20 is $\frac{1}{3}$ of . . | 184 |
| 11. | 4 is $\frac{2}{3}$ of . . | 8 is $\frac{4}{5}$ of . . | 15 is $\frac{3}{8}$ of . . | 184 |
| 12. | 16 in. is . . . times as long as 4 in. | | | 180 |

Multiply. Check by going over the work:

| | | | | |
|---|---|---|---|---|
| 13. | $\frac{1}{6} \times 18$ | $\frac{3}{4} \times 20$ | $\frac{2}{3} \times 24$ | 76 |
| 14. | $\frac{3}{4} \times 11$ | $\frac{7}{8} \times 15$ | $\frac{3}{5} \times 12$ | 77 |
| 15. | $2\frac{1}{3} \times 15$ | $6\frac{1}{4} \times 19$ | $3\frac{1}{3} \times 10$ | 79 |
| 16. | $6 \times 3\frac{1}{5}$ | $10 \times 12\frac{1}{3}$ | $25 \times 32\frac{1}{2}$ | 80 |
| 17. | $\frac{3}{4} \times \frac{5}{8}$ | $\frac{1}{3} \times \frac{7}{8}$ | $\frac{2}{3} \times \frac{4}{5}$ | 89 |
| 18. | $10 \times \frac{4}{5}$ | $\frac{5}{8} \times \frac{3}{5}$ | $\frac{5}{6} \times \frac{3}{10}$ | 91 |
| 19. | $16 \times \frac{5}{6}$ | $\frac{4}{9} \times \frac{15}{16}$ | $\frac{5}{12} \times \frac{18}{25}$ | 92 |
| 20. | $3\frac{1}{5} \times \frac{9}{10}$ | $\frac{3}{8} \times 2\frac{2}{3}$ | $\frac{5}{6} \times 3\frac{1}{3}$ | 99 |
| 21. | $1\frac{1}{4} \times 2\frac{1}{2}$ | $6\frac{2}{5} \times 1\frac{7}{8}$ | $1\frac{1}{8} \times 1\frac{1}{5}$ | 99 |

Diagnostic test.



CHAPTER SIX

# Dividing Decimals

## HOMING PIGEONS

Homing pigeons, which are called *homers* for short, are pigeons that are used for carrying messages and for flying races. The training of a homer begins when it is four weeks old, and by the time it is a year old it is ready to fly long races. These pigeons are given messages to carry when they prove that they can be depended upon. The messages are carried in an aluminum capsule attached to the pigeon's leg.

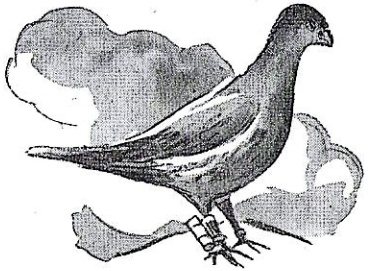
1. When weather conditions are favorable a homer can fly at an average speed of about a mile a minute. How many miles an hour is this?

2. The speed at which a homer flies is often given in *yards per minute*. For example, a homer that flies 1 mi. per minute is flying 1760 yd. per minute, since there are 1760 yd. in 1 mi. If a homer flies $1\frac{1}{4}$ mi. per minute, how many yards per minute does it fly?

3. The fastest speed made by a homer in a race was 3317 yd. per minute. Is this about $1\frac{1}{2}$ mi. per minute, $1\frac{3}{4}$ mi. per minute, or nearly 2 mi. per minute?

4. A homer flew 110 mi. in 86 min. How many yards per minute did this pigeon fly? First change 110 mi. to yards. Find the result to the nearest whole yard.

5. A homer named Beauty made a flight of 500 mi. in 6 hr. 40 min. This was at the rate of how many miles an hour? First change 6 hr. 40 min. to $6\frac{2}{3}$ hr.



## HOMING PIGEONS

1. On a bright clear day many fast homers started on a 270-mile race. The winner of the first prize finished the race in $3\frac{1}{4}$ hr. How many miles per hour did this pigeon average?

2. The following year the 270-mile race was held again but this time it was on a stormy day. The first homer to finish the race took 30 hr. What was the average speed of this pigeon per hour?

3. Compare the answers to ex. 1 and 2. On the clear day the best speed of a homer was about how many times the best speed on a stormy day?

4. A homer was tossed into the air at Havana, Cuba, on July 4 and on July 9 it arrived back home in Baltimore, Maryland, having flown a distance of 1300 mi. in the 5 days. This homer averaged how many miles a day?

5. When a homer flies more than 300 mi. the average speed per hour is usually less than a mile a minute. Pigeons fly slower at night than during the day. A homer called Silver made a long flight of 735 mi. He flew this distance in $17\frac{1}{2}$ hr., part of the trip being made at night. How many miles an hour did Silver average?

6. A Chinese homer made the longest flight that has been recorded. This pigeon was taken by boat from China to France. Three weeks after being set free in France this pigeon was back at his home in China, having flown a distance of about 7300 mi. Find, to the nearest whole mile, the average rate the homer flew in miles per day?





1. Mr. Allen paid $2.60 for 4 tickets to the movies. Find the cost of 1 ticket.

When you divide $2.60 by 4, you are dividing a decimal by a whole number. The decimal point in the quotient is placed directly above the decimal point in $2.60.

```
  $ .65
4)$2.60
```

2. In 6 months 23.76 in. of rain fell in Wilton. What was the average number of inches of rain that fell per month?

Divide 23.76 by 6 to find the average. You divide 23.76 just as you divide dollars and cents. In this work it is important to place the first quotient figure in the proper position. In this case the 3 in the quotient is placed above the last figure of 23 because 23 was divided by 6 to get the first quotient figure. Place the decimal point in the quotient above the decimal point in the dividend. The average rainfall per month was 3.96 in.

```
   3.96
6)23.76
  18
   57
   54
    36
    36
```

3. Work these exercises. Do you get the answers given?

| | | | | |
|---|---|---|---|---|
| 1.6 | .6 | .43 | .323 | .12 |
| 4)6.4 | 9)5.4 | 2).86 | 5)1.615 | 21)2.52 |

Divide. Check the work by multiplying:

| | | | | |
|---|---|---|---|---|
| 4. 6)8.4 | 9)2.88 | 3).777 | 19)138.7 | 15)14.25 |
| 5. 9)9.6 | 4).604 | 7)2.94 | 42)94.08 | 29)3.393 |
| 6. 6).88 | 5)72.5 | 9)43.2 | 27)8.613 | 32)726.4 |
| 7. 8)2.7 | 7).833 | 8).928 | 31)303.8 | 25)3.525 |
| 8. 5)6.5 | 9)6.75 | 4)1.36 | 56)487.2 | 41)446.9 |
| 9. 7).98 | 8)43.2 | 6)34.2 | 23)181.7 | 38)25.46 |

1. Jim is saving money for camp next summer. He needs $55 to stay 4 weeks. Find the cost for one week at camp.

If you divide as shown at *A*, the quotient is $13$\frac{3}{4}$. You can avoid the fraction $\frac{3}{4}$ by writing $55 as $55.00 before you divide, as shown at *B*; this gives $13.75 as the quotient. The cost of 1 week at camp is $13.75.

| *A* | *B* |
|---|---|
| $13$\frac{3}{4}$ | $13.75 |
| 4)$55 | 4)$55.00 |

2. The camp is 137 mi. from Jim's home. Jim's father can drive there in 4 hr. Find his average speed per hour.

If you divide 137 by 4 you get $34\frac{1}{4}$. You can avoid a remainder by writing 137 as 137.00 before you start to divide. The quotient is 34.25 so Jim's father averages 34.25 mi. per hour.

34.25
4)137.00

> To avoid remainders in division, annex zeros after the decimal point of the dividend and continue to divide.

1. John paid $9 for a set of 8 books of adventure. Find the cost of 1 book.

This example may be worked by annexing 2 zeros after $9 as shown at *A*. This gives an answer of $1.12$\frac{1}{2}$. The work may also be done by annexing 3 zeros after $9 as shown at *B*; in this case the division comes out exact and the answer is $1.125. On page 131 you learned that $1.12$\frac{1}{2}$ is another way of writing $1.125 so the two answers are equal.

| *A* | *B* |
|---|---|
| $1.12$\frac{1}{2}$ | $1.125 |
| 8)$9.00 | 8)$9.000 |
| 8 | 8 |
| 10 | 10 |
| 8 | 8 |
| 20 | 20 |
| 16 | 16 |
| 4 | 40 |
| | 40 |

In these problems first divide, expressing each remainder as a fraction in the quotient. Then work the problem again by annexing enough zeros after the dividend to make the division come out exact:

2. Mr. Bates paid $117 for 24 fountain pens to sell in his store. What was the cost of 1 fountain pen?

3. Mrs. Cook made 8 pairs of curtains at a cost of $19. Find the cost of 1 pair of curtains.

4. Mr. Wilson hauled 57 tons of sand in 12 loads. How many tons was that per load?

5. An airplane goes 165 mi. an hour. How many miles is this per minute?

6. Another airplane goes 375 mi. an hour. How many miles per minute does that plane go?

7. Peggy rode her bicycle 13 mi. in 2 hr. How many miles did she average per hour?

8. Mr. Case used 16 gal. of gasoline to drive 252 mi. How many miles did he drive per gallon of gasoline?

9. Divide 32.4 by 24.

In this example annex one zero to 32.4, which gives 32.40.

In ex. 1 to 6 place a decimal point after the dividend and divide. Write enough 0's after the decimal point to make the division come out exact. Check the work:

| | | | | | |
|---|---|---|---|---|---|
| 1. | 4)25 | 24)204 | 16)148 | 25)236 | 12)123 |
| 2. | 6)21 | 25)230 | 24)108 | 36)198 | 25)183 |
| 3. | 8)46 | 32)200 | 84)126 | 32)272 | 25)215 |
| 4. | 2)35 | 75)555 | 64)176 | 16)122 | 34)289 |
| 5. | 8)49 | 28)231 | 25)131 | 56)343 | 75)253 |
| 6. | 4)35 | 12)117 | 44)451 | 28)203 | 45)261 |
| 7. | 8)9.2 | 52)70.2 | 28)32.9 | 25)30.5 | 18)22.5 |

8. Study these examples carefully:

```
   .75          .875          .88          .9A
12)9.00      24)21.000     25)22.00     116)20.00
   84            192          200          23 2
    60           180          200          5 00
    60           168          200          5 00
                  120
                  120
```

Divide, writing enough 0's after the decimal point to make the division come out exact. Check the work:

| | | | | | |
|---|---|---|---|---|---|
| 9. | 6)3 | 25)19 | 48)30 | 75)36 | 225)117 |
| 10. | 5)4 | 96)12 | 25)16 | 72)27 | 244)123 |
| 11. | 4)3 | 88)44 | 64)16 | 25)21 | 192)111 |



Addition Test 4a. Time: 4 min.

| | | | | | |
|---|---|---|---|---|---|
| 1. | 1398 | 3216 | 5046 | 2840 | 6972 |
| | 8435 | 4878 | 6365 | 9938 | 3517 |
| | 2507 | 3110 | 7574 | 8262 | 6880 |
| | 4480 | 8759 | 9457 | 7679 | 4109 |
| | 3029 | 1611 | 1593 | 2425 | 5363 |
| | 4466 | 6232 | 2618 | 1354 | ⑤ 2065 |

Addition Test 4b. Time: 4 min.

| | | | | | |
|---|---|---|---|---|---|
| 2. | 3938 | 5072 | 6794 | 6480 | 2459 |
| | 2127 | 1965 | 3531 | 2659 | 7067 |
| | 6866 | 4343 | 1968 | 8542 | 3370 |
| | 7540 | 7898 | 9135 | 1867 | 5628 |
| | 4295 | 3454 | 2252 | 4718 | 1601 |
| | 5713 | 3101 | 4057 | 4113 | ⑤ 6546 |

Addition Test 4c. Time: 4 min.

| | | | | | |
|---|---|---|---|---|---|
| 3. | 2470 | 1934 | 4262 | 1260 | 3893 |
| | 4569 | 3457 | 3330 | 2559 | 4321 |
| | 7754 | 6883 | 5747 | 7481 | 7826 |
| | 8695 | 9645 | 1986 | 8397 | 8512 |
| | 1322 | 2116 | 8768 | 4035 | 7299 |
| | 3016 | 4167 | 5013 | 4631 | ⑤ 2601 |

Improvement Tests.

## ORAL PRACTICE

4. Read these numbers: 6,827,125,500; 28,004,526,062.
5. How much is $\frac{5}{6} \times \frac{1}{2}$? $6 \times \frac{1}{5}$? $\frac{3}{8} \times 4$?
6. How much is $4 \div \frac{1}{2}$? $\frac{1}{2} \div 6$? $\frac{1}{3} \div \frac{1}{2}$?
7. Find the quotient when 6.3 is divided by 3; by 9.
8. At 12 oranges for 39¢, find the cost of 4 oranges.
9. 6 is $\frac{1}{2}$ of what number? 6 is $\frac{3}{4}$ of what number?

1. In a recent year a record crop of hybrid corn in one state was 118.30 bu. per acre. At this rate, how many bushels of corn would be produced on a field of 10 acres? on a field of 23.7 acres? on a field of 11.4 acres?

2. In another state the record yield of hybrid corn was 108.92 bu. per acre. At this rate, how many bushels of corn would be produced on a field of 30 acres? on a field of 26.5 acres? on a field of 42.5 acres?

3. In a national corn-growing contest each contestant planted 5 acres. The total yields on the 5-acre fields of these contestants were as follows:

| | |
|---|---|
| John Olsen, 600.00 bu. | Bert Allen, 544.60 bu. |
| Fred Brown, 591.50 bu. | Ed Johnson, 525.85 bu. |

What was the average number of bushels produced per acre by each contestant?

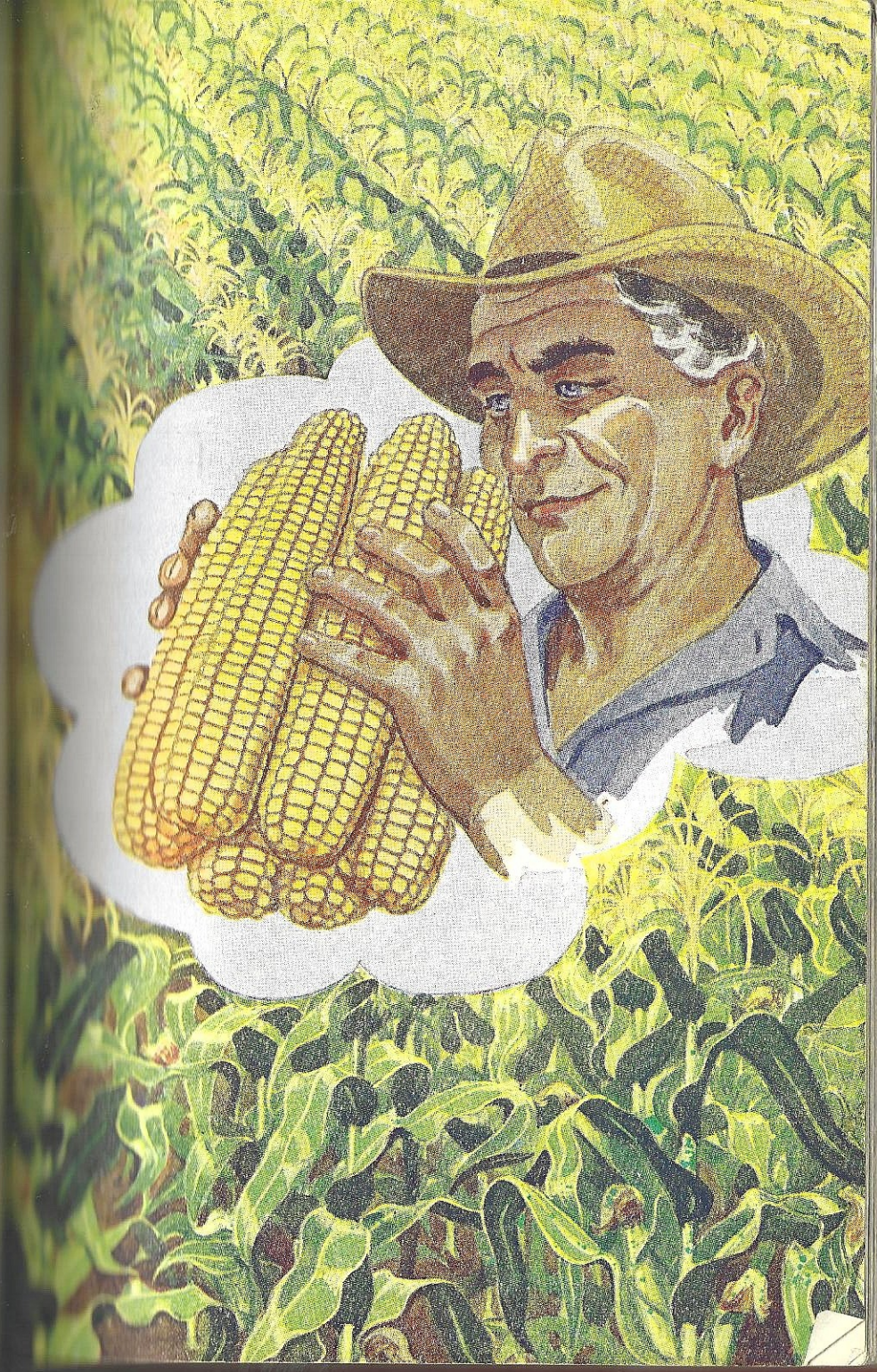
4. A 34-acre field in one state produced 3542.8 bu. of hybrid corn. What was the average yield per acre?

5. Ralph Allen entered a corn-growing contest. On a field of $4\frac{1}{2}$ acres he produced 414 bu. of corn all together. How many bushels per acre did he average?

6. On a 5-acre field Mr. Adams produced a total of 491 bu. of corn. How many bushels did he average per acre? At this rate, how many bushels would he produce on a field of 47.5 acres?

7. In a recent year the farmers of a mid-western state had a total of 4,998,000 acres planted with corn. The average yield that year was 45.5 bu. per acre. What was the total number of bushels of corn produced that year in this state?

8. In the state mentioned in ex. 7, the record yield of corn that year was 97.5 bu. of corn per acre. If all the farmers of the state had produced as much corn per acre as the record yield, how many more bushels of corn would they have produced that year than they actually did produce?



Before decimals can be compared, the decimals must have the same number of decimal places. In some of the examples on page 207 it is necessary to know whether a decimal like 4.82 is closer to 4.8 than to 4.9. Before you can decide this the decimals must have the same number of places, so you first change 4.8 to 4.80 and 4.9 to 4.90. Then you can easily see that 4.82 is closer to 4.80 than to 4.90, which means that 4.82 is closer to 4.8 than to 4.9.

If 4.82 is the answer to an example, you sometimes drop the 2 of 4.82 and call the answer 4.8. You choose 4.8 instead of 4.9 because 4.8 is closer to 4.82. In this case, 4.82 is said to be *rounded off* to the *nearest tenth*, which is 4.8.

In the same way it is sometimes necessary to know whether 4.68 is closer to 4.6 or to 4.7. If you change 4.6 to 4.60 and 4.7 to 4.70, you see that 4.68 is closer to 4.70 (4.7) than to 4.60 (4.6). If 4.68 is the answer to an example, you can *round it off* to the *nearest tenth* by dropping the 8 of 4.68 and calling the answer 4.7. You select 4.7 instead of 4.6 because 4.68 is closer to 4.7 than to 4.6.

If 4.65 is rounded off to the nearest tenth, it becomes 4.7 instead of 4.6. You see that 4.65 is halfway between 4.60 (4.6) and 4.70 (4.7); in such cases the larger *tenth* is always selected.

Answers having 3 decimal places are sometimes rounded off to the *nearest hundredth*. For example, 3.814 may be rounded off to 3.81 because 3.814 is closer to 3.810 than to 3.820. Likewise 3.817 is rounded off to 3.82 because it is closer to 3.820 than to 3.810. 3.815 also becomes 3.82.

*To round off a decimal proceed as follows: If the last figure of the decimal is less than 5, drop it; if the last figure of the decimal is 5 or more, drop it and make the figure before it 1 larger.*

For example, in 5.613, drop the 3, which gives 5.61. In 5.628 drop the 8 and increase the 2 by 1, which gives 5.63.



1. Round off each decimal correct to the nearest tenth: 4.42, 8.36, .75, 3.09, 6.97, 5.14, 42.83, 1.05, 2.68.

2. Round off each decimal correct to the nearest hundredth: 6.125, 1.666, .283, 3.298, .755, 1.142, 5.624.

3. When you divide you often find that the quotient will not come out exact, no matter how many zeros you annex to the dividend. Divide 13 by 7 and show that this is true. In such cases the quotient is carried to 2 or 3 decimal places and then rounded off by dropping the last figure. In the example at the right, the quotient, when carried to 3 decimal places, is 1.857, which becomes 1.86 when rounded off to the nearest hundredth.

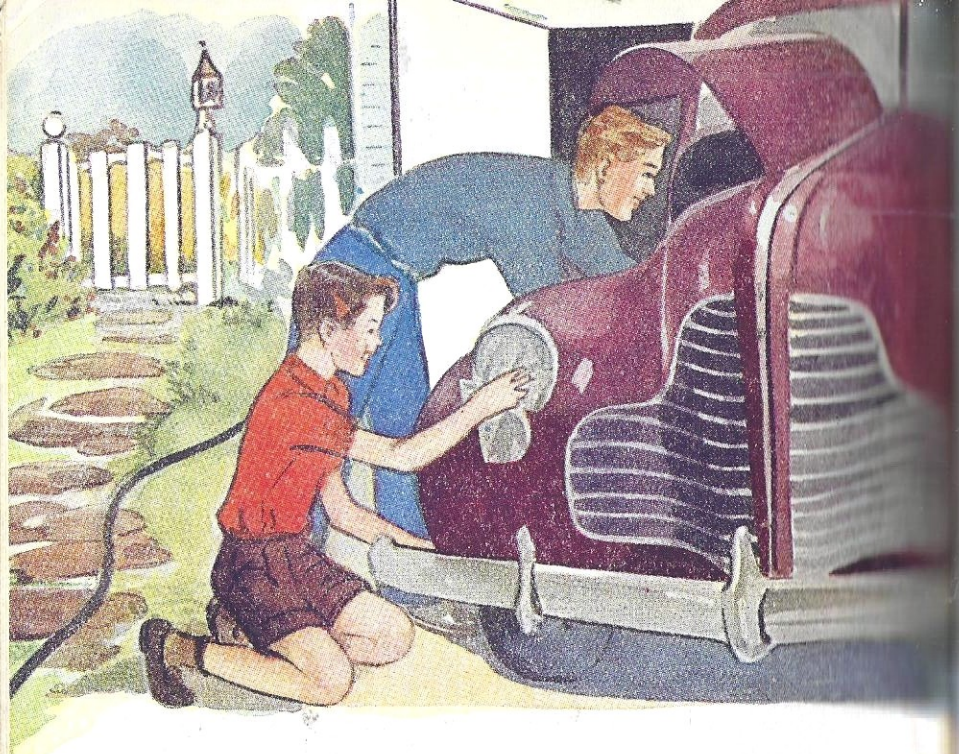
$$\begin{array}{r} 1.857 \\ 7\overline{)13.000} \end{array}$$

Divide. Carry the quotient to two decimal places; then round off the result correct to the nearest tenth:

| | | | |
|---|---|---|---|
| 4. $9\overline{)38}$ | $6\overline{)1.93}$ | $27\overline{)129}$ | $45\overline{)19.9}$ |
| 5. $7\overline{)58}$ | $4\overline{)38.7}$ | $38\overline{)249}$ | $24\overline{)4.52}$ |
| 6. $8\overline{)61}$ | $9\overline{)12.2}$ | $41\overline{)562}$ | $39\overline{)9.77}$ |
| 7. $3\overline{)28}$ | $8\overline{)4.19}$ | $82\overline{)331}$ | $77\overline{)53.5}$ |

Divide. Carry the quotient to three decimal places; then round off the result correct to the nearest hundredth:

| | | | |
|---|---|---|---|
| 8. $3\overline{)11}$ | $3\overline{).46}$ | $9\overline{)6.25}$ | $45\overline{)64.93}$ |
| 9. $6\overline{)17}$ | $9\overline{).94}$ | $6\overline{).827}$ | $33\overline{)5.628}$ |
| 10. $7\overline{)50}$ | $6\overline{).83}$ | $7\overline{)4.03}$ | $42\overline{)28.36}$ |
| 11. $6\overline{)43}$ | $8\overline{).95}$ | $4\overline{).651}$ | $19\overline{)2.007}$ |



## AUTOMOBILE PROBLEMS

1. Bill's father bought a new car last year. He keeps an account of all the expenses connected with running the car. He drove 8336 mi. the past year and used 512 gal. of gasoline. Find, to the nearest tenth of a mile, the number of miles he averaged per gallon of gasoline.

2. The total cost of the gasoline was $109.06 for 512 gal. What was the average cost of the gasoline per gallon? Find the result to the nearest cent.

3. The best time Bill's father ever made on a long trip was last fall when he drove a distance of 283 mi. in 7 hr. What was his average speed per hour? Find the result to the nearest tenth of a mile.

4. For regular driving Bill's father averages 33 mi. per hour. At that rate how many hours does he need to drive 254 mi.? Find the result to the nearest tenth of an hour.





1. Uncle Jack divided $3 equally among 4 boys. How much did each boy get?

If you divide $3 by 4, each part equals $\$\frac{3}{4}$. So each boy got $\$\frac{3}{4}$. $\frac{3}{4}$ means $3 \div 4$. Another way to work the problem is to write $3.00 and then divide $3.00 by 4, which gives $.75. You know that $.75 equals $\frac{3}{4}$ of a dollar. This shows that $\frac{3}{4} = .75$.

$$\begin{array}{r} \$\ .75 \\ 4\overline{)\$3.00} \end{array}$$

2. Change $\frac{3}{8}$ to a decimal.

Remember that $\frac{3}{8}$ means $3 \div 8$. To divide 3 by 8, write a decimal point after 3 and annex zeros. The quotient is $.37\frac{1}{2}$ if you annex 2 zeros or .375 if you annex 3 zeros. So $\frac{3}{8} = .37\frac{1}{2}$, or .375.

$$\begin{array}{r} .37\frac{1}{2} \\ 8\overline{)3.00} \end{array} \qquad \begin{array}{r} .375 \\ 8\overline{)3.000} \end{array}$$

> To change a common fraction to a decimal, put a decimal point after the numerator, annex zeros, and divide by the denominator.

Change these fractions to decimals:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 3. | $\frac{1}{5}$ | $\frac{4}{25}$ | $\frac{3}{8}$ | $\frac{4}{5}$ | $\frac{7}{20}$ | $\frac{1}{2}$ | $\frac{3}{10}$ | $\frac{1}{8}$ |
| 4. | $\frac{7}{8}$ | $\frac{11}{20}$ | $\frac{9}{10}$ | $\frac{5}{8}$ | $\frac{16}{25}$ | $\frac{3}{4}$ | $\frac{17}{20}$ | $\frac{3}{5}$ |

Tell which one is larger. First change the fraction to a decimal; then compare the decimals:

| | | | | |
|---|---|---|---|---|
| 5. | $\frac{7}{8}$ or .93 | $\frac{1}{4}$ or .03 | $\frac{7}{10}$ or .75 | $\frac{1}{8}$ or .11 |
| 6. | $\frac{3}{5}$ or .45 | $\frac{3}{8}$ or .35 | $\frac{11}{25}$ or .41 | $\frac{3}{4}$ or .78 |

7. Remember these fractions and their decimal values:

| | | | |
|---|---|---|---|
| $\frac{1}{4} = .25$ | $\frac{3}{4} = .75$ | $\frac{1}{8} = .12\frac{1}{2}$ | $\frac{5}{8} = .625$ |
| $\frac{1}{2} = .50$ | $1 = 1.00$ | $\frac{3}{8} = .37\frac{1}{2}$ | $\frac{7}{8} = .875$ |

1. Change $\frac{5}{6}$ to a decimal.

To change $\frac{5}{6}$ to a decimal, you first annex zeros to 5 and then divide by 6. If you annex 1 zero, as at $A$, you get $\frac{5}{6} = .8\frac{1}{3}$; if you annex 2 zeros, as at $B$, you get $\frac{5}{6} = .83\frac{1}{3}$; if you annex 3 zeros, as at $C$, you get $\frac{5}{6} = .833\frac{1}{3}$. You see that no matter how many zeros you annex to 5, you always get a remainder. So $\frac{5}{6} = .8\frac{1}{3}$, or $.83\frac{1}{3}$, or $.833\frac{1}{3}$.

$A$

$$\begin{array}{r} .8\frac{1}{3} \\ 6\overline{)5.0} \end{array}$$

$B$

$$\begin{array}{r} .83\frac{1}{3} \\ 6\overline{)5.00} \end{array}$$

$C$

$$\begin{array}{r} .833\frac{1}{3} \\ 6\overline{)5.000} \end{array}$$

2. Change $\frac{2}{3}$ to a decimal correct to the nearest hundredth.

When you change $\frac{2}{3}$ to a three-place decimal, you get .666 with a remainder of 2. The decimal does not come out exact, no matter how far the work is carried out. If you round off .666 to the nearest hundredth, you get .67. So $\frac{2}{3}$ becomes .67, correct to the nearest hundredth.

$$\begin{array}{r} .666 \\ 3\overline{)2.000} \end{array}$$

.67 Ans

A decimal like .666 is called an *incomplete decimal* because it never comes out exact.

Change to incomplete decimals with two places:

3. $\frac{1}{6}$ $\frac{1}{3}$ $\frac{1}{7}$ $\frac{1}{9}$ $\frac{3}{7}$ $\frac{5}{12}$ $\frac{5}{9}$ $\frac{9}{13}$ Ans

Change to incomplete decimals with three places. Then round off each result correct to the nearest hundredth:

4. $\frac{5}{7}$ $\frac{7}{9}$ $\frac{10}{11}$ $\frac{6}{7}$ $\frac{1}{3}$ $\frac{7}{12}$ $\frac{8}{13}$ $\frac{4}{9}$ Ans

Change to mixed decimals correct to the nearest hundredth:

5. $3\frac{1}{3}$ $2\frac{5}{6}$ $4\frac{2}{3}$ $5\frac{2}{7}$ $8\frac{2}{9}$ $7\frac{8}{9}$ $5\frac{8}{11}$ $1\frac{3}{11}$ Ans

6. Remember these fractions and their decimal values:

$\frac{1}{3} = .33\frac{1}{3}$ $\quad \frac{2}{3} = .66\frac{2}{3}$ $\quad \frac{1}{6} = .16\frac{2}{3}$ $\quad \frac{5}{6} = .83\frac{1}{3}$



1. From Boston to Miami is 1639 mi. by one automobile route. Mr. Jones made this trip in 58 hr. of actual driving. What was his average speed per hour? Find the result correct to the nearest tenth of a mile.

2. Mr. Case wants to drive from New York to San Francisco next summer. He finds the distance by one route is 4173 mi. If he usually averages about 25 mi. per hour on long trips, how many hours of actual driving will the trip take? Find the result correct to the nearest tenth of an hour.

3. A 70-story building in New York City is 850 ft. high. What is the average height per story? Find the answer correct to the nearest tenth of a foot.

4. The airline distance between Omaha and Washington is 1012 mi. If a plane travels at an average speed of 225 mi. per hour, how long will the trip take? Find the result correct to the nearest tenth of an hour.

5. On a special run a train traveled 95 mi. in 71 min. Find its speed in miles per minute. Carry the result to three decimal places; then round off the result to the nearest hundredth of a mile.

6. The amount of rain that fell in Knoxville during these months was as follows: April, 3.72 in.; May, 4.84 in.; June, 6.19 in.; July, 5.72 in. Find, to the nearest hundredth of an inch, the average rainfall per month.

7. In a northern town the snowfall for each of 4 months was: 7.5 in., 8.4 in., 11.3 in., 9.3 in. Find, to the nearest tenth of an inch, the average snowfall per month.

8. Add these mixed numbers: $2\frac{1}{4}$, $3\frac{1}{2}$, $4\frac{5}{8}$. Then change each of the fractions to decimals and add them as decimals. Does the decimal answer equal the fractional answer?

9. One year the total rainfall in Greensboro was 52.71 in. Find, to the nearest hundredth of an inch, the average rainfall per month.

Make a good question for each problem so that all the numbers in the problem are used. Then find the answer to your question:

1. In the school lunchroom Henry spent $.25 on Monday, $.28 on Tuesday, $.22 on Wednesday, $.30 on Thursday, and $.25 on Friday.

2. Henry pays for his school lunches out of his weekly allowance of $2.00. See ex. 1.

3. On a map $\frac{1}{4}$ in. represents 1 mi. The distance between Hanover and Westport is $3\frac{1}{2}$ in. on the map.

4. Elizabeth can work 2 arithmetic problems in 3 min. She has 20 problems to do.

5. The distance from Allentown to Jackson by the new highway is 15.3 mi. The distance by the old road that goes along the lake is 17.2 mi.

6. Alice mailed a package that held a sweater weighing 13 oz., a pocket knife weighing 3 oz., and socks weighing 4 oz. The wrapping paper, box, and string weighed 9 oz.

7. In his stamp collection George has 104 stamps from South America and 137 stamps from European countries. He has as many United States stamps as the South American and European stamps together.

8. Frank's chicken yard is 15 ft. by 15 ft. and Peter's chicken yard is 14 ft. by 18 ft.

9. Betty plans to make a knit blanket 72 in. long and 48 in. wide by sewing together knit squares. Each knit square measures 6 in. by 6 in.

10. Bob had to change trains in Chicago and expected to wait $2\frac{1}{4}$ hr. between trains. The train to Chicago was 50 min. late but the train that left Chicago was on time.

11. Mrs. Mason can buy a 2-pound brick of cheese for $.73. The same kind of cheese is sold in $\frac{1}{2}$-pound packages at 20¢ each.



Subtraction Test 4a. Time: 4 min.

| | | | | |
|---|---|---|---|---|
| 1. | $831.27<br>38.84 | $560.50<br>311.86 | $627.39<br>49.63 | $535.80<br>187.33 |
| 2. | $461.02<br>201.83 | $368.29<br>20.46 | $200.00<br>103.75 | $349.53<br>91.55 |
| 3. | $612.70<br>26.17 | $437.18<br>337.62 | $559.23<br>85.38 | (12) $650.48<br>71.89 |

Subtraction Test 4b. Time: 4 min.

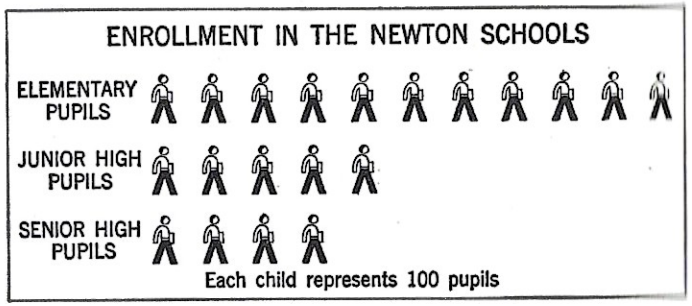
| | | | | |
|---|---|---|---|---|
| 4. | $641.82<br>375.29 | $312.45<br>65.90 | $371.64<br>43.73 | $449.46<br>158.68 |
| 5. | $813.84<br>476.86 | $276.27<br>228.71 | $388.95<br>42.48 | $291.21<br>45.79 |
| 6. | $134.26<br>75.77 | $531.69<br>97.04 | $208.08<br>54.36 | (12) $500.00<br>391.48 |

Subtraction Test 4c. Time: 4 min.

| | | | | |
|---|---|---|---|---|
| 7. | $759.72<br>382.83 | $134.49<br>34.78 | $324.58<br>148.63 | $421.53<br>34.86 |
| 8. | $162.60<br>76.48 | $528.31<br>262.44 | $249.38<br>45.87 | $642.41<br>78.52 |
| 9. | $200.00<br>170.57 | $436.09<br>68.32 | $155.12<br>87.58 | (12) $612.70<br>176.75 |

Improvement Tests.

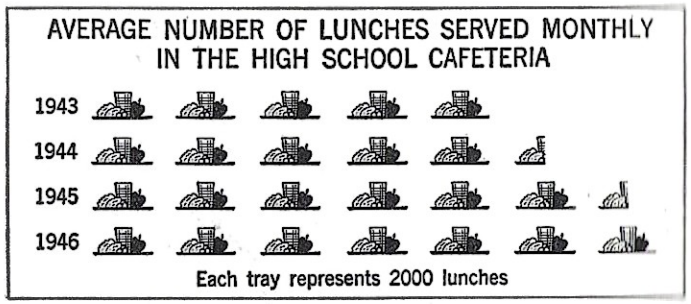
**1.** From school John brought home a printed report about the schools of Newton. John found this *picture graph*, or *pictograph*, that interested him.




Tell how many pupils there are in each division of the Newton schools. Each child represents 100 pupils.

Count the children in the line marked "Elementary Pupils." Since each child represents 100 pupils, there are 11 × 100 pupils, or 1100 pupils, in the elementary schools. Tell the number of pupils in each of the other divisions.

**2.** On another page of the report John found this picture:




Study the pictograph and tell the number of lunches served monthly in each of the four years. In the years 1944 and 1945, how many lunches does the half tray represent?

**3.** Try to find a good pictograph in a newspaper or magazine and bring it to class.



1. Make a pictograph to show that last year Mr. Wilson shipped 14,000 boxes of oranges and that this year he shipped 17,000 boxes. Use a small drawing of an orange box to represent 2000 boxes of oranges. Above the pictograph put a title and below it tell how many boxes of oranges each orange box represents.

2. Draw a bar graph to show the number of papers each of these boys sold last week: Bill, 350; Sam, 300; Henry, 275; George, 250. Decide what scale you will use before you begin to draw the graph.

3. Draw a bar graph to show the number of papers each of these same boys sold last month: Sam, 1000; Bill, 900; George, 850; Henry, 825.

4. Draw a line graph showing these changes in temperature during part of a day:

| Hour | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|---|---|---|---|---|
| Degrees | 62 | 62 | 64 | 69 | 72 | 76 | 77 | 78 | 76 | 70 |

5. By looking at the graph you made in ex. 4, answer these questions:

(*a*) At what hour was the temperature the highest?
(*b*) Between what hours did it rise the fastest?
(*c*) Between what hours did it drop the fastest?
(*d*) Between what hours did it remain the same?

6. Draw a line graph showing the changes in the prices of eggs that Jack sold during these months:

| Month | Jan. | Feb. | Mar. | Apr. | May | June | July |
|---|---|---|---|---|---|---|---|
| Price | 68¢ | 65¢ | 60¢ | 52¢ | 48¢ | 50¢ | 55¢ |

7. Draw a line graph to show these changes in Ann's weight for the past 6 yr.: 1941, 61 lb.; 1942, 64 lb.; 1943, 67 lb.; 1944, 69 lb.; 1945, 72 lb.; 1946, 75 lb.

1. Mr. Day works in a railroad ticket office. He sells round-trip tickets to the seashore at $1.35 each. How much does he take in if he sells 10 tickets? if he sells 100 tickets? if he sells 1000 tickets?

| *A.* | *B.* | *C.* |
|---|---|---|
| $1.35 | $1.35 | $1.35 |
| 10 | 100 | 1000 |
| $13.50 | $135.00 | $1350.00 |

When you multiply $1.35 by 10, as shown at *A*, you could get the answer $13.50 by moving the decimal point in $1.35 one place to the right.

When you multiply $1.35 by 100, as shown at *B*, you could get the answer $135.00 by moving the decimal point in $1.35 two places to the right.

When you multiply $1.35 by 1000, as shown at *C*, you could get the answer $1350.00 by moving the decimal point in $1.35 three places to the right. In this case you have to write a zero after $1.35 so that you can move the decimal point three places.

> To multiply a number by 10, 100, or 1000 move the decimal point as many places to the right as there are zeros in the multiplier.

2. Multiply $12.25 by 10; by 100; by 1000.
3. Multiply .783 by 10; by 100; by 1000.

Using the rule, multiply each number by 10; by 100; by 1000:

| | | | | | | |
|---|---|---|---|---|---|---|
| 4. $6.25 | $.18 | $.125 | $115 | .6 | .03 | 6.5 |
| 5. $1.27 | $.37 | $.183 | $283 | .9 | .08 | 1.9 |

6. Find the cost of 10 ft. of heavy wire at $.165 a foot.
7. Find the cost of 100 air mail stamps at $.08 each.
8. Find the cost of 1000 sheets of paper at $.005 each.
9. Find the cost of 100 books at $1.29 each.



1. Mrs. Wilson bought 10 yd. of ribbon for $1.35. What was the cost per yard?

To multiply by 10 you move the decimal point one place to the right. To divide by 10 you move the decimal point one place to the left. The ribbon cost $.135, or 13½¢, a yard.

$1.35 ÷ 10 = $.135

2. Sally can buy 100 Christmas cards in a box for $4.50. Find the cost of 1 card.

To divide by 100 you move the decimal point two places to the left. Since there is only one figure to the left of the decimal point you must place a zero in front of 4 so that you can move the decimal point two places to the left. The cards cost $.045, or 4½¢, each.

$4.50 ÷ 100 = $.045

3. Study these exercises:

275 ÷ 100 = 2.75  $81.00 ÷ 10 = $8.10  $12.00 ÷ 1000 = $.012

> To divide by 10, 100, or 1000, move the decimal point as many places to the left as there are zeros in the divisor.

Using the rule above, divide each number by 10; by 100:

| | | | | | |
|---|---|---|---|---|---|
| 4. $18.50 | $3.00 | 36.8 | 74 | $554 | 7.8 |
| 5. $27.00 | $6.50 | 26.3 | 82 | $287 | 4.1 |

Divide each number by 1000:

| | | | | | |
|---|---|---|---|---|---|
| 6. 5630 | 4881 | $350 | 4 | $85 | 1368 |
| 7. 9819 | 6725 | $585 | 8 | $20 | 2500 |
| 8. 3005 | 1992 | $5.00 | 6 | $32 | 8316 |

1. Learn this table of weight:

| | | |
|---|---|---|
| 16 ounces (oz.) | = | 1 pound (lb.) |
| 100 pounds | = | 1 hundredweight (cwt.) |
| 2000 pounds | = | 1 ton (T.) |

2. A new unit of weight, called the *hundredweight*, is given in the table above. Freight and express rates are often given by the hundredweight. Cattle are bought and sold for the market by the hundredweight. Try to find out what other things are sold by the hundredweight.

3. Mr. Wilson shipped some furniture by freight. The weight was 350 lb. and the charge was $1.30 per hundredweight. How much did it cost to ship the furniture?

You change pounds to hundredweight by moving the decimal point two places to the left, so 350 lb. = 3.5 cwt. 350 lb. will cost 3.5 × $1.30, or $4.55.

4. If it costs $1.80 to send 100 lb. (1 cwt.) of books by express, how much will it cost to send 150 lb.? 600 lb.? 25 lb.? 75 lb.? 50 lb.? 400 lb.? 340 lb.?

5. Mr. Lee shipped some hogs to the livestock market. Their total weight was 4200 lb. The hogs sold at $9.50 per hundredweight. How much did Mr. Lee get for the hogs?

6. Name 2 things that are sold by the ounce; 3 things that are sold by the pound; 2 things that are sold by the ton.

7. What part of a pound is 12 oz.? 4 oz.? 10 oz.?

Tell the number to put in each space:

8. 4 lb. 6 oz. = . . . oz. 5000 lb. = . . . T.

9. 3 lb. 2 oz. = . . . oz. 500 lb. = . . . T.

10. 1 lb. 4 oz. = . . . oz. 275 lb. = . . . cwt.



1. Study these examples carefully:

$$A.\ 2\overline{)14}^{\,7} \qquad B.\ 20\overline{)140}^{\,7} \qquad C.\ 200\overline{)1400}^{\,7}$$

At $A$ the divisor is 2, the dividend is 14, and the quotient is 7. If you multiply both 2 and 14 by 10, you get 20 and 140, as at $B$; the quotient at $B$ is still 7. At $A$ if you multiply both 2 and 14 by 100, you get 200 and 1400, as at $C$, but the quotient is still 7.

> Multiplying both the divisor and the dividend by 10, by 100, or by 1000 does not change the quotient.

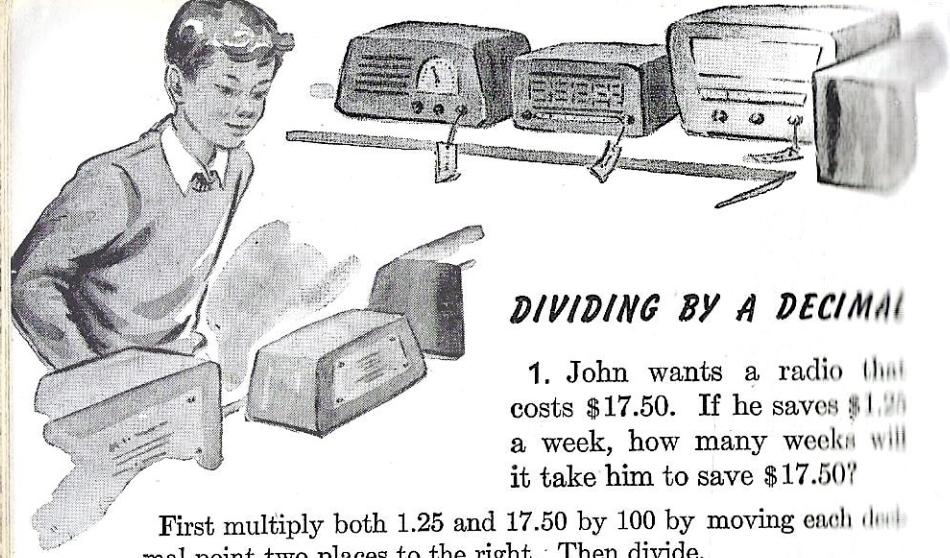
2. Tom paid $2.10 for some tennis balls. The balls cost $.35 each. How many tennis balls did he buy?

If you try to divide 2.10 by .35, as shown at $D$, you see that the divisor .35 is a decimal. You have not yet learned how to divide by a decimal but you do know how to divide by a whole number. If you multiply .35 by 100 by moving the decimal point two places to the right, you get 35, which is a whole number. Since you have multiplied .35 by 100, you must also multiply 2.10 by 100, which gives 210.

$$D \qquad .35\overline{)2.10} \qquad\qquad E \qquad \begin{array}{r} 6 \\ 35\overline{)210} \\ \underline{210} \end{array}$$

You now have a new example, as shown at $E$, where the dividend and divisor are each whole numbers. The quotient at $E$ will be the same as at $D$; see ex. 1 above. If you now work example $E$ you get a quotient of 6, so 6 is also the quotient for $D$. Tom bought 6 tennis balls.

3. At $.25 a yard, how many yards of ribbon can you buy for $2.00? How many yards can you buy for $3.00?



## DIVIDING BY A DECIMAL

1. John wants a radio that costs $17.50. If he saves $1.25 a week, how many weeks will it take him to save $17.50?

First multiply both 1.25 and 17.50 by 100 by moving each decimal point two places to the right. Then divide.

2. Mr. Adams told the man at the gas station to fill the tank of his car with gasoline. The gasoline cost $2.64. The price of the gasoline was $.22 a gallon. How many gallons of gasoline did he buy?

3. How many air mail stamps at $.08 each can you buy for $2.00? How many can you buy for $6.00?

First write the example as shown at *A*. Then change .08 to a whole number by moving the decimal point two places to the right; this gives 08. which is the same as 8. Also move the decimal point in 2.00 two places to the right which gives 200. The example then appears as shown at *B*. Divide the numbers at *B*. How many air mail stamps can you buy for $2.00?

| *A* | *B* |
|---|---|
| .08)2.00 | 8)200 |

Divide. First change each divisor to a whole number:

| | | |
|---|---|---|
| 4. $9.75 ÷ $.75 | $12.15 ÷ $1.35 | 114.4 ÷ 4.4 |
| 5. $7.52 ÷ $.16 | $74.52 ÷ $2.07 | 243.2 ÷ 3.8 |
| 6. $9.50 ÷ $.38 | $44.32 ÷ $5.54 | 15.81 ÷ .17 |
| 7. $8.25 ÷ $.25 | $74.75 ÷ $3.25 | 374.1 ÷ 4.3 |





1. A train traveled 170 mi. in 3.5 hr. Find, to the nearest tenth of a mile, its average speed in miles per hour.

To make the divisor 3.5 a whole number, move the decimal point one place to the right, which gives 35. Also move the decimal point in 170 one place to the right; to do this, first annex a zero after 170, which gives 1700.

Instead of writing the example again with the decimal points in the new position, as at *B*, use a caret (ʌ), as at *A*, to indicate the new position of each decimal point. Also do the work at *A*. Place the decimal point in the quotient directly above the caret in 170.0ʌ00. The train had an average speed of 48.57 mi. an hour, which becomes 48.6 mi. to the nearest tenth of a mile.

| *A* | *B* |
|---|---|
| 4 8.57<br>3.5ʌ)170.0ʌ00<br>140<br>30 0<br>28 0<br>2 0 0<br>1 7 5<br>2 50<br>2 45<br>5 | 35)1700 |

By using carets you save the erasing of the decimal points. The carets make it easy to see that the original divisor and dividend are 3.5 and 170 which you use in checking.

To check the work, multiply 48.57 by the original divisor 3.5 and add the remainder 5, remembering that 5 is in *thousandths* place and means .005. The result should equal 170.

*In dividing by a decimal, place a caret (ʌ) as many places to the right of the decimal point in both divisor and dividend as there are decimal places in the divisor. Place the decimal point in the quotient above the caret in the dividend.*

Carry quotients to 2 decimal places and round off to the nearest tenth:

| | | | |
|---|---|---|---|
| 2. .8)30.7 | .6)8.608 | 2.3)1267 | 7.5)492.07 |
| 3. .6)7.739 | .4)52.17 | .19)253.6 | 6.4)38.311 |
| 4. .9)438 | .9)3.828 | .36)1.284 | .81)62.139 |

1. Jack walked 1.75 mi. in .5 hr. What was his average speed in miles per hour?

2. A fast airplane flew a distance of 18.75 mi. in 2.5 min. Find the speed of the airplane in miles per minute. Also find its speed in miles per hour.

3. Mr. Wilson paid $2.20 for a 100-pound sack of potatoes. What was the cost of the potatoes per pound? At that rate what was the cost of 5 lb.? of 15 lb.?

4. The expenses for the school picnic were $67.10. If 355 pupils and teachers shared the expenses, how much did each one pay? Find the answer to the nearest cent.

5. Mr. Best has found that last year it cost him $.065 a mile to run his car. At that rate how much did it cost him to run the car 100 mi.? 1000 mi.? 10,000 mi.?

Divide. If the quotient does not come out exact, carry it to 2 decimal places and round off to the nearest tenth:

| | | | | | |
|---|---|---|---|---|---|
| 6. | $3\overline{)17}$ | $.7\overline{).28}$ | $.2\overline{).143}$ | $1.6\overline{)2.43}$ | $.051\overline{)1.28}$ |
| 7. | $4\overline{)1.5}$ | $.5\overline{)6.3}$ | $.7\overline{)2.76}$ | $3.2\overline{)39.7}$ | $.211\overline{)4.61}$ |
| 8. | $.6\overline{).52}$ | $8\overline{).94}$ | $4\overline{)3.88}$ | $.19\overline{).361}$ | $26.3\overline{)62.0}$ |
| 9. | $.8\overline{)1.7}$ | $9\overline{)6.3}$ | $6\overline{)25.1}$ | $.42\overline{)69.9}$ | $.004\overline{).168}$ |
| 10. | $.4\overline{).56}$ | $.3\overline{)7.9}$ | $.9\overline{).294}$ | $.08\overline{)127}$ | $.005\overline{)4.20}$ |
| 11. | $.9\overline{)4.3}$ | $.6\overline{).55}$ | $.5\overline{).326}$ | $.06\overline{)90.8}$ | $.008\overline{)38.1}$ |
| 12. | $.7\overline{).31}$ | $3\overline{).29}$ | $.6\overline{)52.1}$ | $.19\overline{)2.53}$ | $.006\overline{).750}$ |
| 13. | $.4\overline{)7.2}$ | $7\overline{)33}$ | $.9\overline{)3.82}$ | $.36\overline{)1.28}$ | $.009\overline{).458}$ |



Add and check:

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1. | 781 | 252 | 363 | 320 | 443 | 311 | 306 |
| | 426 | 377 | 154 | 471 | 816 | 735 | 628 |
| | 173 | 625 | 216 | 505 | 43 | 484 | 503 |
| | 552 | 93 | 533 | 200 | 725 | 86 | 175 |
| | 348 | 292 | 891 | 98 | 68 | 47 | 330 |
| | 250 | 136 | 640 | 133 | 34 | 374 | 97 |
| | 169 | 28 | 212 | 84 | 106 | 245 | 231 |
| | 324 | 435 | 588 | 699 | 921 | 123 | 468 |
| 2. | 17.1 | 22.4 | .440 | 4.23 | .263 | 3.25 | 26.3 |
| | 28.3 | 63.0 | .625 | 6.06 | .007 | 4.50 | 7.9 |
| | 4.6 | 10.5 | .125 | 2.55 | .035 | 2.75 | 5.8 |
| 3. | $24\frac{1}{2}$ | $80\frac{2}{3}$ | $37\frac{7}{12}$ | $21\frac{11}{16}$ | $15\frac{1}{2}$ | $40\frac{3}{4}$ | $25\frac{7}{10}$ |
| | $46\frac{3}{4}$ | $16\frac{1}{6}$ | $43\frac{3}{4}$ | $33\frac{13}{16}$ | $13\frac{3}{5}$ | $50\frac{5}{6}$ | $12\frac{1}{2}$ |

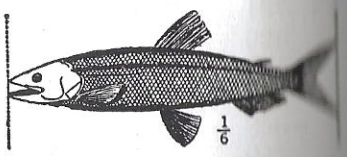
Divide and check:

| | | | | | |
|---|---|---|---|---|---|
| 4. | $8\overline{).992}$ | $3\overline{)82.5}$ | $.12\overline{)14.88}$ | $273\overline{)23478}$ | $196\overline{)589176}$ |
| 5. | $7\overline{)5.74}$ | $5\overline{).725}$ | $1.5\overline{)355.5}$ | $423\overline{)20727}$ | $318\overline{)316092}$ |

Find the answers:

| | | | | |
|---|---|---|---|---|
| 6. | $\frac{2}{3} \times \frac{3}{4}$ | $4\frac{1}{2} \div \frac{1}{4}$ | $7\frac{1}{2} \times 18$ | $6\frac{3}{8} + 4\frac{1}{2}$ |
| 7. | $\frac{7}{8} + \frac{3}{16}$ | $1\frac{3}{4} + \frac{3}{4}$ | $28 \div 1\frac{3}{4}$ | $3\frac{3}{4} \times 2\frac{1}{2}$ |
| 8. | $\frac{9}{16} \div \frac{3}{8}$ | $3\frac{2}{3} \times 3$ | $4\frac{5}{6} + 1\frac{1}{3}$ | $1\frac{1}{8} \times 3\frac{1}{3}$ |
| 9. | $\frac{9}{10} - \frac{1}{2}$ | $5\frac{1}{4} - \frac{7}{8}$ | $1\frac{2}{3} \times 1\frac{1}{2}$ | $4\frac{1}{2} \div 1\frac{1}{8}$ |
| 10. | $\frac{3}{8} \times \frac{1}{3}$ | $2\frac{1}{10} \times \frac{5}{6}$ | $2\frac{1}{4} \div 1\frac{1}{3}$ | $5\frac{1}{3} \div 1\frac{3}{5}$ |
| 11. | $\frac{4}{5} \times \frac{1}{5}$ | $6\frac{2}{3} \div 8$ | $8\frac{3}{4} - 2\frac{7}{8}$ | $3\frac{1}{4} + 2\frac{2}{3}$ |
| 12. | $4 \div \frac{1}{3}$ | $6\frac{1}{4} \div \frac{5}{12}$ | $2\frac{9}{10} + 3\frac{1}{2}$ | $12 - 4\frac{1}{4}$ |
| 13. | $\frac{1}{3} \times \frac{1}{2}$ | $3\frac{3}{8} \div \frac{3}{4}$ | $40 \div 2\frac{2}{3}$ | $5\frac{1}{4} + 3\frac{7}{8}$ |
| 14. | $\frac{1}{4} + \frac{5}{6}$ | $2\frac{5}{6} + 1\frac{3}{4}$ | $3\frac{1}{2} \times 19$ | $1\frac{3}{5} \div 1\frac{1}{3}$ |

1. In a large dictionary Jack found these pictures:




Under the man-eater shark, the fraction $\frac{1}{120}$ tells the scale to which the picture is drawn and means that the length of the picture is only $\frac{1}{120}$ of the length of a shark. So the shark is 120 times as long as the picture. Find the length in inches of the picture of the shark, measuring between the dotted lines. Then multiply this length by 120 and change the inches to feet. How many feet long is a man-eater shark?

2. The picture of the smelt is the same length as the picture of the shark but the fraction under the smelt is $\frac{1}{6}$. The length of a smelt is how many times as long as the picture? How many inches long is a smelt?

3. In the picture of the hornet the fraction $\frac{2}{3}$ means that any measurement in the picture is $\frac{2}{3}$ as long as it would be on a real hornet. In the picture you find that the wingspread, measuring between the dotted lines, is 1 in., so 1 in. is $\frac{2}{3}$ of the wingspread of a real hornet. You find the wingspread of a real hornet like this:

$\frac{2}{3}$ of the wingspread = 1 in.
$\frac{1}{3}$ of the wingspread = $\frac{1}{2}$ in.
$\frac{3}{3}$ of the wingspread = $\frac{3}{2}$ in., or $1\frac{1}{2}$ in.

So the real hornet has a wingspread of $1\frac{1}{2}$ in.

4. The picture of a moth, drawn to a scale of $\frac{2}{3}$, has a wingspread of 2 in. Find the wingspread of a real moth. The picture of a butterfly, drawn to a scale of $\frac{3}{4}$, has a wingspread of $2\frac{1}{4}$ in. Find the wingspread of the real butterfly.



Multiplication Test 4a. Time: 5 min. after copying.

| | | | | | |
|---|---|---|---|---|---|
| 1. 3069 | 4827 | 2854 | 6397 | 7248 | 3962 |
| 85 | 67 | 39 | 42 | 15 | ⑥ 36 |

Multiplication Test 4b. Time: 5 min. after copying.

| | | | | | |
|---|---|---|---|---|---|
| 2. 3619 | 5482 | 8245 | 6073 | 3527 | 1639 |
| 91 | 48 | 27 | 85 | 69 | ⑥ 73 |

Multiplication Test 4c. Time: 5 min. after copying.

| | | | | | |
|---|---|---|---|---|---|
| 3. 5948 | 4906 | 6819 | 7592 | 7425 | 4357 |
| 56 | 92 | 74 | 18 | 27 | ⑥ 45 |

Improvement Tests.

## THE LANGUAGE OF ARITHMETIC

Below each sentence are words or groups of words. Choose the right word or words to complete the sentence:

4. 4.59 may be ------ ------ to 4.6.

quickly reduced  rounded off

5. To add $\frac{3}{4}$ and $\frac{5}{6}$ you find the ------ ------ ------.

least common denominator  two partial products

6. The area of a rectangle is the ------ of its length and its width.

sum  product

7. Pounds are changed to hundredweight by ------ by 100.

multiplying  dividing

8. The name of the second place to the right of the decimal point is ------.

thousandths  hundredths

**1.** Mary bought a roll of ribbon for \$.52. The roll contained 8 yd. of ribbon. Find the cost of the ribbon per yard.

Divide .52 by 8, annexing a zero at the right of .52 to avoid a remainder. Place the 6 in the quotient above the 2 of 52 since 52 was divided by 8 to get 6. Write the decimal point in the quotient directly above the decimal point in .520. This leaves an empty space in the quotient between the decimal point and the 6 which should be filled with a zero. The quotient is .065. The ribbon cost \$.065, or $6\frac{1}{2}$¢, per yard.

```
 .065
8).520
```

**2.** Last month a large store spent \$129 for 3-cent stamps to put on letters and bills. How many 3-cent stamps did the store buy?

Change the divisor to a whole number by multiplying by 100; to do this write a caret to the right of .03. Since 129 has no decimal places it becomes 12,900 when multiplied by 100; put a caret to the right of 12,900. Place the decimal point in the quotient above the caret in 129.00∧. The first two figures of the quotient are 43; there are two empty spaces between 43 and the decimal point which should be filled with two zeros. The quotient is 4300. The store bought 4300 3-cent stamps. To check multiply 4300 by .03.

```
   43.00
.03∧)129.00
```

Divide and check:

| | | | | |
|---|---|---|---|---|
| 3. 9)$\overline{.36}$ | 5)$\overline{.135}$ | 7)$\overline{.035}$ | 1.2)$\overline{.108}$ | .08)$\overline{40.8}$ |
| 4. 7)$\overline{.56}$ | 6)$\overline{.234}$ | 9)$\overline{.081}$ | .06)$\overline{24.6}$ | 2.5)$\overline{.175}$ |
| 5. 3)$\overline{.27}$ | 8)$\overline{.072}$ | 2)$\overline{.006}$ | .07)$\overline{154}$ | .04)$\overline{256}$ |
| 6. 4)$\overline{.32}$ | 9)$\overline{.171}$ | 3)$\overline{.024}$ | .09)$\overline{23.4}$ | .06)$\overline{348}$ |



1. Study these examples carefully:

```
     150.                .09                1900.
.037∧)5.550∧        1.6∧).1∧44        .025∧)47.500∧
      3 7                1 44                25
      1 85                                   22 5
      1 85                                   22 5
```

Divide and check:

| | | | | |
|---|---|---|---|---|
| 2. 3)$\overline{2.4}$ | 3)$\overline{.24}$ | .3)$\overline{2.4}$ | .3)$\overline{.24}$ | .03)$\overline{24}$ |
| 3. 4)$\overline{.08}$ | .4)$\overline{.8}$ | .4)$\overline{.08}$ | .4)$\overline{88}$ | .04)$\overline{8.8}$ |
| 4. 6)$\overline{.36}$ | .6)$\overline{36}$ | .6)$\overline{.36}$ | 6)$\overline{.036}$ | .06)$\overline{36}$ |
| 5. 8)$\overline{5.6}$ | .8)$\overline{.56}$ | 8)$\overline{.056}$ | .8)$\overline{5.6}$ | .08)$\overline{5.6}$ |

Divide. Find the quotients to the nearest tenth:

| | | | | |
|---|---|---|---|---|
| 6. 6)$\overline{.41}$ | .2)$\overline{.223}$ | .07)$\overline{24}$ | .013)$\overline{.222}$ | .13)$\overline{4.286}$ |
| 7. .7)$\overline{25}$ | .4)$\overline{3.87}$ | .29)$\overline{.35}$ | 1.62)$\overline{.453}$ | 2.5)$\overline{31.79}$ |
| 8. .8)$\overline{.33}$ | 5)$\overline{3.14}$ | 18)$\overline{.98}$ | 31.3)$\overline{59.8}$ | .09)$\overline{1.444}$ |
| 9. 4)$\overline{7.1}$ | .3)$\overline{28.9}$ | 6.3)$\overline{80}$ | .118)$\overline{.026}$ | 12)$\overline{73.81}$ |
| 10. .9)$\overline{6.8}$ | .8)$\overline{31}$ | .09)$\overline{3.5}$ | .009)$\overline{.438}$ | .35)$\overline{1.996}$ |

Divide. Find the quotients to the nearest hundredth:

| | | | |
|---|---|---|---|
| 11. 5.3)$\overline{28.377}$ | .25)$\overline{32.284}$ | .34)$\overline{2.415}$ | 1.2)$\overline{1.484}$ |
| 12. .29)$\overline{11.633}$ | 4.1)$\overline{18.263}$ | 4.5)$\overline{1.832}$ | .25)$\overline{21.36}$ |
| 13. 6.5)$\overline{108.84}$ | 32)$\overline{247.62}$ | 2.6)$\overline{2.222}$ | .78)$\overline{2.365}$ |

In these exercises the quotients are given, but the decimal points have been left out. In some quotients the 0's are also omitted. In each quotient put the decimal point in the right place, supplying 0's if necessary:

| | | | | |
|---|---|---|---|---|
| 1. | 93<br>.4)372 | 113<br>8.7)9.831 | 9 8<br>.024)235.2 | 1 07<br>.625)668.75 |
| 2. | 43<br>9).387 | 84<br>22)1.848 | 13<br>11.3)1469 | 59 1<br>.066)3438.6 |
| 3. | 74<br>.7)5.18 | 9 4<br>.19)178.6 | 39<br>211)8.229 | 2 99<br>36.4)833.56 |
| 4. | 9 6<br>.3)28.8 | 36<br>37)1.332 | 10 7<br>.079)845.3 | 31 5<br>25.1)7906.5 |
| 5. | 69<br>.6)414 | 96<br>7.3)70.08 | 9<br>2.84)2.556 | 96<br>182)17,472 |
| 6. | 38<br>8).304 | 2 03<br>.35)71.05 | 6 8<br>.062)421.6 | 4 09<br>.092)370.76 |
| 7. | 7 1<br>.9)63.9 | 72<br>18)1.296 | 44<br>2.18)95.92 | 63<br>435)27,405 |
| 8. | 34<br>6).204 | 76<br>2.1)15.96 | 9 24<br>.009)83.16 | 7 8<br>2.73)2129.4 |

After each exercise three answers are given but only one answer is correct. Tell which answer is correct without working the exercise:

9. Does 20.01 ÷ 8.7 equal .023, or .23, or 2.3?
10. Does 1.026 ÷ 1.9 equal 540, or .54, or 5.4?
11. Does 353.8 ÷ 6.1 equal 58, or 580, or .058?
12. Does 41.07 ÷ 37 equal 111, or 1110, or 1.11?
13. Does 3.255 ÷ 3.5 equal .93, or 93, or .093?
14. Does 427.2 ÷ .48 equal 8.9, or 89.0, or 890?
15. Does 23.85 ÷ 5.3 equal 4.5, or 45.0, or 450?
16. Does 220.8 ÷ 24 equal .92, or 9.2, or 92?



At the end of each problem there are three numbers. Select the number you think is nearest to the right answer. Then work the problem and compare your answer with the number selected:

1. A round-trip ticket to Bristol costs $3.03. Find the cost of making that round trip once a week for 50 weeks. $15.00 $150.00 $16.00

2. John has $6.95. If he buys 4 books at 49¢ each, how much money will he have left? $3.50 $4.00 $5.00

3. Mr. Ward bought 15 gal. of gasoline at $.196 a gallon. How much did the gasoline cost? $4.00 $3.50 $3.00

4. Mr. Bush drove his car 707 mi. and used 35 gal. of gasoline. What was the average number of miles he drove per gallon of gasoline? 18 mi. 20 mi. 22 mi.

5. Last month Bill sold a total of 2522 papers in 26 days. What was the average number of papers he sold per day? 85 papers 90 papers 100 papers

6. At the beginning of the week Mary had $2.01 on hand. Then she received her weekly allowance of $.75 and earned $.20 doing errands. During the week she spent $.39 for the movies and $.60 for a book. What was her balance at the end of the week? $1.50 $2.00 $2.50

7. Mr. West spent $3.99 for gasoline and oil for his new car. The gasoline cost $1.89. How much did the oil cost? $1.00 $1.50 $2.00

8. How much change do you get from $5.00 if you buy 3 yd. of muslin at $.48 a yard and a dress pattern for $.51? $3.00 $2.50 $2.00

9. Four girls shared the cost of buying 8 packages of colored paper at 19¢ a package. What was each girl's share of the cost? 40¢ 35¢ 30¢

10. Joe had $4.03 left after paying $.95 for seeds. How much did he have before buying the seeds? $4 $5 $6

1. Using the numbers 4, 5, 6, or any two of them, write an example of each of these: a proper fraction in its lowest terms; a proper fraction that can be reduced; an improper fraction; a mixed number.

2. Write three fractions that each equal $\frac{1}{2}$; write two fractions that each equal $\frac{3}{4}$.

Add. Check by going over the work:

| | | | | | | |
|---|---|---|---|---|---|---|
| 3. | $4\frac{1}{2}$ | $3\frac{7}{16}$ | $2\frac{3}{10}$ | $1\frac{5}{6}$ | $5\frac{1}{2}$ | $6\frac{5}{6}$ | $2\frac{1}{8}$ |
| | $2\frac{3}{4}$ | $2\frac{9}{16}$ | $1\frac{1}{10}$ | $\frac{5}{12}$ | $4\frac{2}{3}$ | $3\frac{1}{4}$ | $3\frac{1}{8}$ |
| 4. | $1\frac{1}{5}$ | $4\frac{3}{4}$ | $2\frac{5}{6}$ | $2\frac{1}{4}$ | $3\frac{1}{2}$ | $3\frac{5}{6}$ | $3\frac{1}{8}$ |
| | $3\frac{7}{10}$ | $2\frac{1}{2}$ | $3\frac{1}{3}$ | $3\frac{1}{3}$ | $1\frac{3}{8}$ | $2\frac{1}{2}$ | $2\frac{3}{8}$ |
| | $2\frac{1}{2}$ | $3\frac{3}{4}$ | $1\frac{1}{12}$ | $1\frac{1}{4}$ | $2\frac{1}{4}$ | $1\frac{1}{3}$ | $1\frac{1}{8}$ |

Subtract. Check by going over the work:

| | | | | | | |
|---|---|---|---|---|---|---|
| 5. | 1 | $3\frac{13}{16}$ | $4\frac{1}{2}$ | $2\frac{5}{6}$ | 6 | $4\frac{1}{2}$ | $3\frac{1}{8}$ |
| | $\frac{2}{3}$ | $2\frac{5}{16}$ | $1\frac{3}{10}$ | $2\frac{1}{2}$ | $\frac{3}{4}$ | $2\frac{2}{3}$ | $3\frac{3}{8}$ |
| 6. | 5 | $4\frac{3}{4}$ | $9\frac{1}{4}$ | $3\frac{1}{10}$ | $7\frac{1}{8}$ | $3\frac{1}{4}$ | $6\frac{1}{8}$ |
| | $2\frac{1}{6}$ | $2\frac{11}{12}$ | $2\frac{7}{8}$ | $\frac{3}{5}$ | $3\frac{1}{2}$ | $2\frac{15}{16}$ | $3\frac{3}{8}$ |

Find the answers:

| | | |
|---|---|---|
| 7. | $\frac{5}{8} \times 6$ | $12 \times 2\frac{1}{4}$ |
| 8. | $\frac{9}{16} \div \frac{3}{4}$ | $1\frac{7}{8} \div 10$ |
| 9. | $4 \times \frac{3}{5}$ | $16 \div 1\frac{1}{3}$ |
| 10. | $\frac{3}{4} \div 6$ | $2\frac{1}{2} \times 2\frac{1}{4}$ |
| 11. | $\frac{1}{2} \times \frac{3}{8}$ | $3\frac{1}{3} \div 1\frac{1}{4}$ |
| 12. | $6 \div \frac{2}{3}$ | $10 \times 2\frac{1}{4}$ |

1. The speedometer on Mr. Bell's car read 10,386 mi. at the beginning of the year and 19,008 mi. at the end of the year. How many miles did Mr. Bell drive during the year?

2. In a boat race Mr. Hill's boat went 20.5 mi. in 25 min. What was the rate in miles per minute? in miles per hour? Give the answers to hundredths of a mile.

3. In our school there are 648 pupils. Of this total number, 360 are boys. The boys are what part of the pupils?

4. Find the cost of $1\frac{3}{4}$ lb. of chops at \$.50 a pound.

5. Last fall Mr. Bates had 85 bu. of apples to sell. He sold 32 bu. at \$1.75 a bushel and the rest at \$2.25 a bushel. How much in all did he get for his apples?

6. In 6 months the total snowfall on Blue Mountain was 104 in. Find the average monthly snowfall on Blue Mountain to the nearest tenth of an inch.

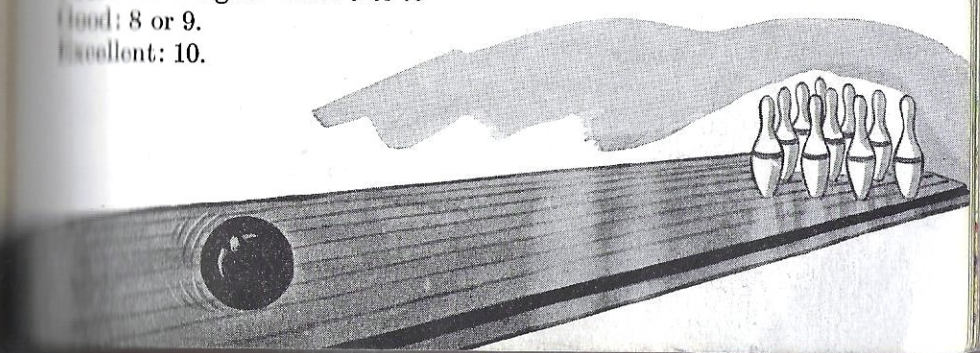
7. A train and an airplane leave Weston at the same time. The train's speed is 48 mi. per hour and the airplane's speed is 175 mi. per hour. In 3 hr. how much farther does the airplane go than the train?

8. At 36 for a dime, find the cost of 144 thumbtacks.

9. Find the average weight of three girls with these weights: 73 lb., $75\frac{1}{2}$ lb., and $77\frac{1}{4}$ lb.

10. Last winter Jack sold a total of 62 doz. eggs and received \$32.36 for them. Find, to the nearest cent, the average selling price per dozen eggs.

Poor: 0 to 5 right. Fair: 6 or 7.
Good: 8 or 9.
Excellent: 10.



1. Jane bought a quart of ice cream for $.65. She served 6 persons with it. What was the cost of 1 serving of ice cream? Find the answer to the nearest cent.

2. The distance from Allentown to Fenton is 100 mi. The trip one way costs $2.50. What is the cost per mile?

3. Jack's brother finished college this spring. He sent home a box of books that weighed 220 lb. At $1.25 per hundredweight, what did it cost to send the box home?

Change these fractions to exact decimals:

4. $\frac{1}{2}$ $\frac{3}{4}$ $\frac{7}{8}$ $\frac{1}{5}$ $\frac{1}{4}$ $\frac{5}{8}$ $\frac{4}{5}$ $\frac{3}{20}$ $\frac{[illegible]}{[illegible]}$

Change to decimals correct to the nearest hundredth:

5. $\frac{3}{7}$ $\frac{5}{6}$ $\frac{1}{9}$ $\frac{2}{3}$ $\frac{8}{9}$ $\frac{1}{6}$ $\frac{1}{3}$ $\frac{7}{12}$ $\frac{[illegible]}{[illegible]}$

Divide until the quotient comes out exact. Annex zeros to the dividend if necessary:

6. $7\overline{)2.59}$ $5\overline{)16.3}$ $8\overline{).064}$ $44\overline{)957}$ $15\overline{)24[illegible]}$

7. $.4\overline{)62.8}$ $.8\overline{)5.92}$ $.2\overline{).327}$ $2.8\overline{)644}$ $.32\overline{)76[illegible]}$

8. $.6\overline{).174}$ $3\overline{).216}$ $4\overline{).36}$ $.07\overline{).042}$ $19\overline{)24[illegible]}$

Divide. In ex. 9 and 10 find quotients correct to the nearest tenth. In ex. 11 find quotients correct to the nearest hundredth:

9. $4\overline{)1.7}$ $.3\overline{).98}$ $5\overline{).38}$ $23\overline{)101}$ $.33\overline{)1.7[illegible]}$

10. $9\overline{)60}$ $8\overline{)5.9}$ $7\overline{)6.8}$ $5.2\overline{).375}$ $7.6\overline{)26.[illegible]}$

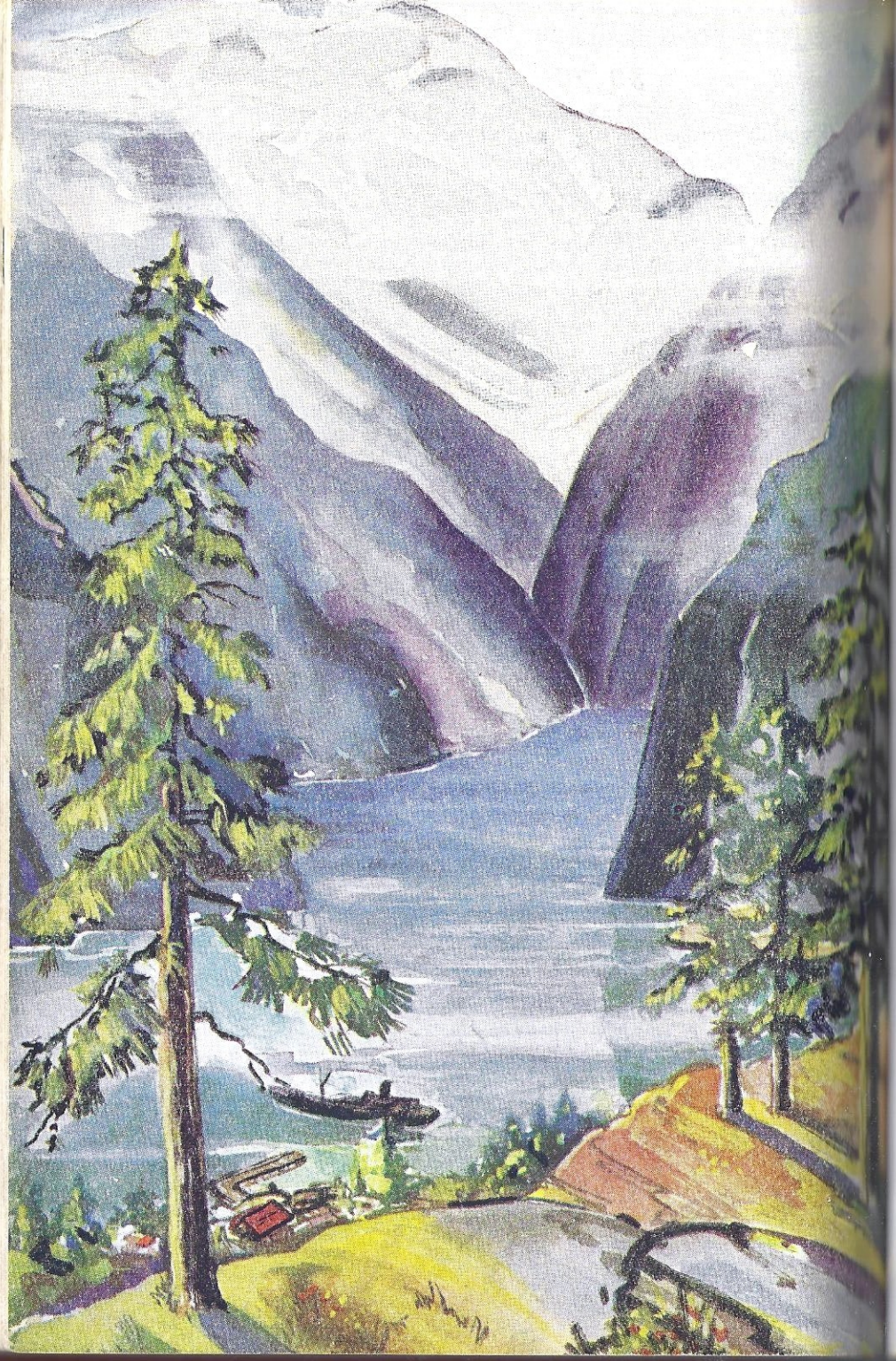
11. $7\overline{).57}$ $6\overline{)10}$ $9\overline{).87}$ $21\overline{).183}$ $37\overline{)59.[illegible]}$



If you miss more than one example in any row, turn to the Practice Page for that row.

| | | | | | PRACTICE PAGES |
|---|---|---|---|---|---|
| Multiply each number by 1000: | | | | | |
| 1. 38 | 4.7 | .029 | 3.84 | | 216 |
| Divide each number by 100: | | | | | |
| 2. 293 | 15.2 | 47 | 2638 | | 217 |
| Change to decimals correct to the nearest hundredth: | | | | | |
| 3. $\frac{8}{9}$ | $\frac{6}{7}$ | $\frac{4}{9}$ | $\frac{2}{9}$ | $\frac{10}{11}$ | 210 |
| Divide, annexing zeros when necessary to make the quotient come out exact: | | | | | |
| 4. $3\overline{).81}$ | $7\overline{)6.3}$ | $8\overline{)49.6}$ | $9\overline{).945}$ | | 199 |
| 5. $4\overline{)29}$ | $8\overline{)75}$ | $2\overline{)1.23}$ | $5\overline{)177}$ | | 202 |
| 6. $8\overline{)7}$ | $4\overline{)3}$ | $5\overline{)2}$ | $6\overline{)3}$ | | 202 |
| 7. $.6\overline{)4.8}$ | $1.2\overline{)9.6}$ | $.24\overline{)3.12}$ | $1.16\overline{)33.64}$ | | 220 |
| 8. $4\overline{).28}$ | $6\overline{).054}$ | $.7\overline{)812}$ | $.08\overline{)136}$ | | 227 |
| Divide. Carry the quotient to 2 decimal places; then round it off to the nearest tenth: | | | | | |
| 9. $6\overline{)19}$ | $7\overline{)15}$ | $9\overline{)25}$ | $27\overline{)39.2}$ | | 207 |
| 10. $.9\overline{)4.77}$ | $.6\overline{)137}$ | $.7\overline{)2.391}$ | $.11\overline{)24.9}$ | | 221 |
| 11. $.03\overline{)4.7}$ | $.06\overline{).29}$ | $.007\overline{)1.3}$ | $.009\overline{)1.38}$ | | 222 |

Diagnostic test.



CHAPTER SEVEN

# Measurements

## ALASKA

1. The coast of Southeast Alaska is one of the scenic wonderlands of the world. It has hundreds of islands, snow-covered mountains, beautiful fiords, and gigantic glaciers that crawl slowly to the sea. Where the Columbia Glacier enters the sea it forms a great wall of ice 12 mi. wide and 750 ft. high. If a building were 750 ft. high, how many stories would it have, allowing $12\frac{1}{2}$ ft. per story?

2. A glacier is a slow-moving river of ice that starts in high mountains. The largest glacier in Alaska is Malaspina Glacier. It has an area of 1500 sq. mi. Rhode Island has an area of 1214 sq. mi. Malaspina Glacier covers how many square miles more than Rhode Island?

3. Though Alaska has hundreds of glaciers, they cover only .03 of its area of 586,400 sq. mi. How many square miles of Alaska's area are covered by glaciers?

4. To see its magnificent scenery about 25,000 tourists make a round trip from Seattle or Canadian ports to Southeast Alaska each year. They go by steamships that sail through the Inside Passage, which is the beautiful water route between the islands and the mainland. The average round-trip fare per person is $135. If a steamer has 346 passengers on one trip, how much do the fares total?

5. The round trip from Seattle to Skagway, Alaska, by the Inside Passage takes 11 days. A steamer leaving Seattle on July 26 would return to Seattle on what date?

1. Alaska is the largest territory belonging to the United States. Alaska is an Indian word meaning "The Great Land." It is well named for it has an area of 586,400 sq. mi. The United States has an area of 3,022,400 sq. mi. Is Alaska about $\frac{1}{4}$, $\frac{1}{5}$, or $\frac{1}{6}$ of the size of the United States?

2. The largest state in the United States is Texas. It has an area of 267,340 sq. mi. Alaska's area is about how many times as large as that of Texas?

3. The productive land in Alaska consists of 385,000 sq. mi. of fine forests, 65,000 sq. mi. of land suitable for farming, and 35,000 sq. mi. suitable for grazing. The rest of Alaska is made up of mountains, glaciers, volcanoes, and other unproductive land. How many square miles of productive land are there in Alaska? Is this productive land about $\frac{1}{3}$ or about $\frac{5}{6}$ of the total area of Alaska?

4. Alaska has the highest mountain in North America, which is Mt. McKinley. It is 20,300 ft. high. Tom says that Mt. McKinley is almost 4 mi. high. Is Tom right? How many feet less than 4 mi. high is Mt. McKinley?

5. The highest mountain in the United States is Mt. Whitney in California whose height is 14,495 ft. Mt. McKinley is how many feet higher than Mt. Whitney? Is Mt. McKinley a mile, or more than a mile, higher than Mt. Whitney?

6. The Yukon River is Alaska's longest and most important river; its length is 2300 mi. Of our rivers only the Mississippi and the Missouri are longer than the Yukon. The Mississippi River is 2470 mi. long; the Missouri is 2432 mi. long. The length of the Yukon is how many miles less than that of the Mississippi? than that of the Missouri?

7. In 1940 Alaska's population was made up as follows: whites, 39,170; Eskimos, 15,576; Indians, 11,283; Aleuts, 5597; other races, 896. Find the total population in 1940.

8. The Yukon runs west through Alaska dividing it roughly into two halves. About $\frac{1}{6}$ of the population live in the northern half of Alaska and the rest in the southern half. How many people live in each half of Alaska? See ex. 7.

9. In 1940 the populations of the chief towns of Alaska were as follows: Juneau, 5729; Ketchikan, 4695; Anchorage, 3495; Fairbanks, 3455; Sitka, 1987; Nome, 1559; Petersburg, 1323; Wrangell, 1162. What is the total population of these eight towns? About what part of the total population of Alaska lives in these eight towns?

10. In the year 1891 some reindeer were brought to Alaska from Lapland and Siberia to furnish food and clothing for the Eskimos who were facing starvation due to poor fishing conditions. These reindeer increased rapidly in numbers so that there were about 22,000 of them in 1910; 93,000 in 1920; 700,000 in 1930; and 400,000 in 1940. Draw a bar graph showing the numbers of reindeer in the years mentioned.

11. In 1937 Congress passed a law prohibiting the ownership of reindeer by anyone except the Eskimos. This was done to protect the Eskimos against commercial companies that were raising and selling reindeer to the disadvantage of the Eskimos. How many years ago was this law passed? How is the effect of this law shown in the graph you made in ex. 10?

1. Fishing is the most important industry in Alaska and the most valuable fish is the salmon. About $\frac{9}{10}$ of each year's salmon catch is canned. The rest of the catch is sold fresh, frozen, or smoked. What part of the salmon catch is not canned?

2. In a recent year 330,000,000 lb. of salmon were canned. The canned salmon is packed in cases, each containing 48 one-pound cans. How many cases of salmon will 330,000,000 lb. produce? Each case of salmon sold at an average of $7.80 per case. Find the total amount received that year for the salmon.

3. In the same year the salmon that was not canned brought about $2,200,000. How much in all was received that year for the salmon catch? See ex. 2.

4. That year Alaska also sold halibut, herring, and other fish worth $3,500,000. What was the total amount that Alaska got for all its fish that year? See ex. 3.

5. The United States bought Alaska in 1867 for $7,200,000. The value of the fish caught in one year, as shown in ex. 4, is about how many times the amount paid for Alaska?

6. The mining industry is second in importance in Alaska, gold being the chief mineral produced. During a recent year Alaska produced 757,000 oz. of gold which sold at $35.00 an ounce. What was the total amount received that year for gold? The value of all other minerals produced that year was $2,229,000. What was the total value of the minerals produced that year, including gold?

7. The fur industry is third in importance in Alaska. During a recent year the values of the furs sold were as follows: beaver, $285,000; fox pelts of all kinds, $720,000; fur seal, $575,000; marten, $170,000; mink, $465,000; muskrat, $235,000; all other pelts, $221,000. What was the total value of the furs sold that year?

## TOTEM POLES

Certain tribes of Indians in and near Alaska used to erect totem poles before their houses. On these poles figures of animals, birds, or fish were carved which told the tribes or families to which the Indians belonged.

1. The carving of a pole was a big undertaking. After a perfect cedar tree was found, it was hollowed out by fire. The hollow tree trunk was then taken to the village where the slow work of carving began. The carver of a totem pole received as pay for his work 100 to 250 Indian blankets which were worth about $3 each in our money. Find the value in dollars of a carver's pay if he received 250 blankets for his work.

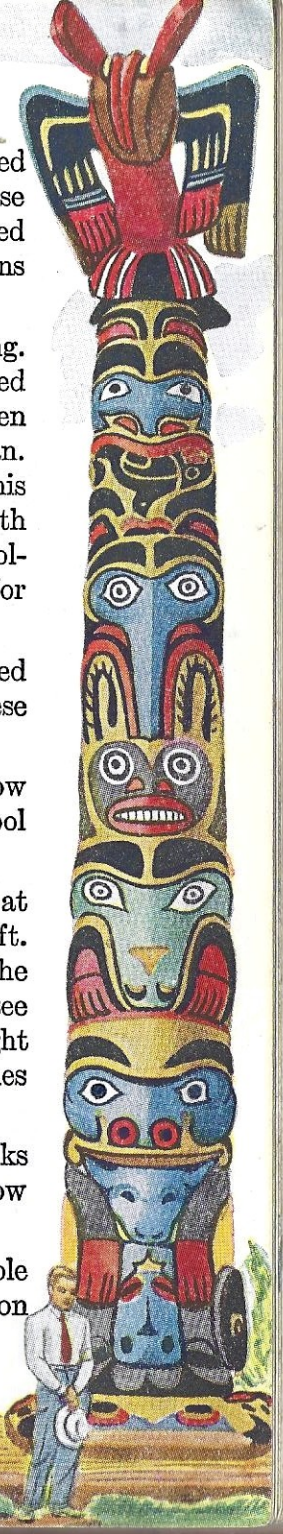
2. The carver of one of the tallest poles received 385 blankets. Find the value in dollars of these blankets.

3. Some totem poles were 40 to 50 ft. high. How does 50 ft. compare with the height of your school flagpole?

4. About how many feet high is the totem pole at the right? The man standing near the pole is 6 ft. tall. Check your rough estimate by marking off the man's height on the edge of a piece of paper; then see how many times this height is contained in the height of the pole. Is the pole *about* 5 times or *about* 6 times as high as the man?

5. Most of the totem poles seen today in the parks and museums of Alaska were carved after 1860. How old, at most, would some of these poles be?

6. One of the first men to report seeing a totem pole near Alaska was an explorer who visited that region in 1790. How many years ago was that?



1. Last fall Mr. Black put lawn seed on the lawn at the side of his house. The lawn is 35 ft. wide and 40 ft. long. He bought 1 lb. of seed for each 200 sq. ft. of lawn. How many pounds of seed did he buy?

2. Mr. West has $\frac{1}{2}$ acre of land to plant this spring. He wants to buy fertilizer for it and finds that he needs 100 lb. of fertilizer for each 1000 sq. ft. of ground. How many pounds of fertilizer does he need? Remember that an acre contains 43,560 sq. ft.

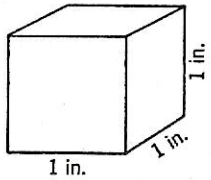
3. If Mr. West buys the fertilizer in 100-pound bags, how many bags of fertilizer will he have to buy? Find the cost at $2.59 per bag.

4. Mr. Dean wants to put bone meal fertilizer on his lawn which is 65 ft. by 75 ft. He needs 6 lb. for every 100 sq. ft. of lawn. How many pounds of bone meal does he need?

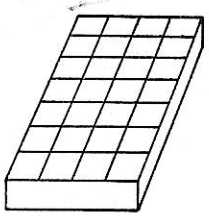
5. Mr. Dean can buy the bone meal in bags of 50 lb. each at $1.89 or in bags of 100 lb. each at $3.25. Which weight of bag should he buy and how many of them? Find the cost.

6. Across the street from Lincoln School is a lot containing $\frac{1}{4}$ acre which is used for school gardens. If each garden contains about 50 sq. ft., how many gardens can there be? Give your answer to the nearest whole number.

1. A small block 1 inch wide, 1 inch long, and 1 inch high is called an *inch cube* because each of the three dimensions is 1 inch. The block *contains* 1 cubic inch; its *volume* is also 1 *cubic inch*, or 1 *cu. in.*




2. Mary had an empty box 4 in. wide, 7 in. long, and 1 in. deep. How many inch cubes like that in ex. 1 will it take to fill the box? How many cubic inches does the box contain?



You see from the picture that there is a row of 4 inch cubes (4 cubic inches) across the width of the box and that it takes 7 of these rows to fill the box. So the box contains $7 \times 4$ cu. in., or 28 cu. in. The box has a volume of 28 cu. in.

3. In ex. 2 suppose Mary's box is 4 in. wide, 7 in. long, and 2 in. deep. Since it is 2 in. deep it will hold 2 layers of inch cubes. Each layer contains 28 cu. in. so 2 layers contain $2 \times 28$ cu. in., or 56 cu. in. The box has a volume of 56 cu. in. A short way to find 56 is to multiply the three dimensions together like this: $2 \times 7 \times 4 = 56$.

4. Anything having the shape of an ordinary box is called a *rectangular solid.*

> To find the volume of a rectangular solid, multiply its length by its width by its height.

Find the volumes of boxes with these dimensions:

| | |
|---|---|
| 5. 2 in. $\times$ 4 in. $\times$ 5 in. | 10 in. $\times$ 16 in. $\times$ 20 in. |
| 6. 3 in. $\times$ 6 in. $\times$ 9 in. | 12 in. $\times$ 12 in. $\times$ 15 in. |
| 7. $\frac{1}{2}$ in. $\times$ 8 in. $\times$ 8 in. | $2\frac{1}{2}$ in. $\times$ 10 in. $\times$ 12 in. |

## FINDING VOLUMES

1. Alice's grandmother sent her a birthday gift by mail. The gift was packed in a box 1 ft. long, 1 ft. wide, and 1 ft. high. Since all the dimensions of the box are 1 ft., the box is a *cube* and *its volume* is 1 *cubic foot*, or 1 *cu. ft.*

2. Suppose a box is 2 ft. wide, 3 ft. long, and 2 ft. high. How many cubic feet does the box contain?

3. Which box holds more, one that is 1 ft. × 2 ft. × 3 ft. or one that is 2 ft. × 2 ft. × 2 ft.?

4. A very large box, shaped like a cube, might have its width, its length, and its height all 1 yd. Then it would contain 1 *cubic yard*, or 1 *cu. yd.* You see that the three measures of volume are the *cubic inch*, the *cubic foot*, and the *cubic yard*. Name an object, shaped like a box, whose volume might be measured by the cubic inch. Name an object whose volume might be measured by the cubic foot.

5. Joe and Jack have a big wooden box which they are filling with supplies for camp. The box is 3 ft. long, 2 ft. wide, and 18 in. deep. Find the volume of the box.

In finding the volume, all the dimensions must first be changed to the same unit of measure. In this example, change 18 in. to $1\frac{1}{2}$ ft. Then all the dimensions will be in *feet*. The box contains $3 \times 2 \times 1\frac{1}{2}$ cu. ft. What is its volume?

Find these volumes:

| | | |
|---|---|---|
| 6. 2′ × 3′ × 16″ | 6′ × 8′ × 3′ | 4′ × 18″ × 24″ |
| 7. 4′ × 3′ × 9″ | 3″ × 5″ × 1″ | 6′ × 15″ × 12″ |
| 8. 6′ × 6″ × 8″ | 3′ × 6′ × 10″ | 1′ × 18″ × 2″ |





1. If the three dimensions of a cube are each 1 ft., the volume is 1 cu. ft. Change 1 ft. to 12 in. and then the dimensions are 12 in. × 12 in. × 12 in. and the volume is 1728 cu. in. This shows that 1 cu. ft. equals 1728 cu. in.

2. If the three dimensions of a cube are each 1 yd., the volume is 1 cu. yd. Change 1 yd. to 3 ft. and then the dimensions are 3 ft. × 3 ft. × 3 ft. and the volume is 27 cu. ft. This shows that 1 cu. yd. equals 27 cu. ft.

3. Learn this table of *cubic measure:*

1728 cubic inches (cu. in.) = 1 cubic foot (cu. ft.)
27 cubic feet (cu. ft.) = 1 cubic yard (cu. yd.)

4. How many cubic inches are there in 5 cu. ft.? how many in $1\frac{1}{2}$ cu. ft.? in $2\frac{1}{4}$ cu. ft.?

5. How many cubic feet are there in 10 cu. yd.? how many in $1\frac{1}{2}$ cu.yd.? in $3\frac{1}{3}$ cu. yd.?

6. How many cubic yards are there in 54 cu. ft.? how many in 81 cu. ft.? in 135 cu. ft.?

7. Ann's aquarium is 12 in. wide, 18 in. long, and 11 in. deep. She keeps the water 9 in. deep so that it will not run over the sides. Does she have more or less than 1 cu. ft. of water in her aquarium?

8. Mr. Johnson had a cellar dug for his new house. The cellar is 33 ft. long, 18 ft. wide, and 8 ft. deep. How many cubic yards of earth had to be removed?

9. In a schoolroom there should be 200 cu. ft. of air space for each pupil. Jack's schoolroom is 30 ft. long, 25 ft. wide, and 12 ft. high. How many cubic feet of air space are there in that room? Is that air space enough for the 26 pupils in Jack's room?

10. How many cubic feet of air space are there in your room?

1. The aquarium at school is 11 in. wide, 21 in. long, and 12 in. deep. How many gallons of water are needed to fill it full? to fill it to a depth of 9 in.? 1 gallon occupies 231 cu. in.

Find the number of cubic inches in the volume of the aquarium when it is full of water. Since 1 gal. of water fills a space of 231 cu. in., divide the number of cubic inches of volume by 231 to find how many gallons are needed to fill the aquarium full.

2. Henry has a small aquarium 6 in. wide, 11 in. long, and 8 in. deep. He fills it with water to a depth of 7 in. How many gallons of water does Henry put in? 1 gal. = 231 cu. in.

3. Workmen finished digging a ditch $2\frac{1}{2}$ ft. wide and 90 ft. long. Soon after that a heavy rain flooded the ditch to a depth of 8 in. How many gallons of water fell in the ditch? 1 cu. ft. of water = about $7\frac{1}{2}$ gal.

4. A gallon of liquid fills a space of 231 cu. in. If a rectangular can has a width of $3\frac{1}{2}$ in. and a length of 6 in., how many inches high should it be to hold 1 gal.? Do you think the can should be exactly that number of inches high? Give a reason for your answer.

5. If a rectangular can is $5\frac{1}{2}$ in. wide, 7 in. long, and $12\frac{1}{8}$ in. high, will it hold 1 gal. or 2 gal. when filled?

6. It takes about $7\frac{1}{2}$ gal. of water to fill the space occupied by 1 cu. ft. If a rectangular tank is $6\frac{2}{3}$ ft. long and $4\frac{3}{4}$ ft. wide, how many gallons of water are needed to fill it to a depth of 4 ft.?

7. How many cubic inches does a quart occupy? a pint? Give your answer to the nearest cubic inch. See ex. 1.

Suppose these are the dimensions of some rectangular cans. Which cans hold about a pint? Which cans hold about a quart?

8. $3\frac{1}{2}'' \times 5'' \times 1\frac{3}{4}''$ $\quad$ $6'' \times 6'' \times 1\frac{5}{8}''$

9. $3\frac{1}{4}'' \times 5'' \times 1\frac{7}{8}''$ $\quad$ $2'' \times 4'' \times 7\frac{3}{8}''$



Division Test 4a. Time: 5 min. after copying.

1. 66)13024 $\quad$ 82)18860 $\quad$ 48)23288

2. 51)47084 $\quad$ 19)15979 $\quad$ ⑥ 43)26101

Division Test 4b. Time: 5 min. after copying.

3. 22)14005 $\quad$ 37)21386 $\quad$ 16)11300

4. 56)21848 $\quad$ 73)71905 $\quad$ ⑥ 84)10584

Division Test 4c. Time: 5 min. after copying.

5. 45)19219 $\quad$ 18)15660 $\quad$ 28)18438

6. 31)23130 $\quad$ 39)19812 $\quad$ ⑥ 78)14742

Improvement Tests.

## MIXED PRACTICE

Find the answers:

7. What is the average of 27.3, 37.4, 19.1, 43.2, 34.0, 32.4, and 29.2?

8. Find the cost of 24 lemons at 2 lemons for 5¢.

9. Multiply 629 by 3.4; 807 by .72; 21.2 by 3.4.

10. Divide 68 by 1.7; by .04; by .85.

11. Divide .225 by .15; by 1.5; by .015.

12. Multiply each number by $\frac{3}{4}$: $\frac{1}{3}$, $2\frac{2}{3}$, 9, 14, $1\frac{1}{3}$.

13. Find the area of a rectangle 9.5 ft. by 14.0 ft.

14. Divide each number by $\frac{2}{3}$: 6, 11, $\frac{4}{5}$, $5\frac{1}{3}$, $6\frac{3}{4}$.

To the Teacher: In ex. 1–6, instruct pupils to write the remainder, if any, as a fraction in the quotient.

Change these fractions to decimals:

1. $\frac{1}{2}$ $\frac{1}{4}$ $\frac{3}{4}$ $\frac{7}{20}$ $\frac{3}{10}$ $\frac{73}{100}$ $\frac{9}{100}$ $\frac{297}{1000}$

Change these decimals to fractions:

2. .27 .11 .07 .5 .297 .018 .004

Which decimal is larger?

3. .6 or .59 .37 or .375 .4 or .225

Which is larger, the fraction or the decimal? First change the fraction to a decimal:

4. $\frac{1}{3}$ or .336 $\frac{7}{8}$ or .89 $\frac{5}{8}$ or .622
5. $\frac{1}{2}$ or .475 $\frac{3}{4}$ or .72 $\frac{2}{3}$ or .707

Copy and add or subtract:

6. 1.75 + 9.42 + 8.11 + 16.35 + 7.04 15.6 − 11.4
7. .443 + .075 + .125 + .563 + .006 4.83 − 2.95
8. 5.7 + 4.385 + 19.2 + 1.5 + 3.75 6.00 − 4.08

Multiply and check:

9. .008 × 7 16.5 × 3.5 .21 × .4 .01 × .8 12.75 × 2.6 1320 × .065

10. .216 × 4 7.25 × .3 .06 × .9 5.3 × .22 133.6 × 5.8 23.82 × 7.5

Divide and check:

11. 5)1.28 .3)95.1 .06)2.736 .18)15.3 13.6)8.84

12. .3)$\overline{.048}$ .8)496 .15)1320 25)1.15 .124)80.6

13. 6)$\overline{.084}$ .5)19.2 .04)1.144 1.3)117 16.5)95.7

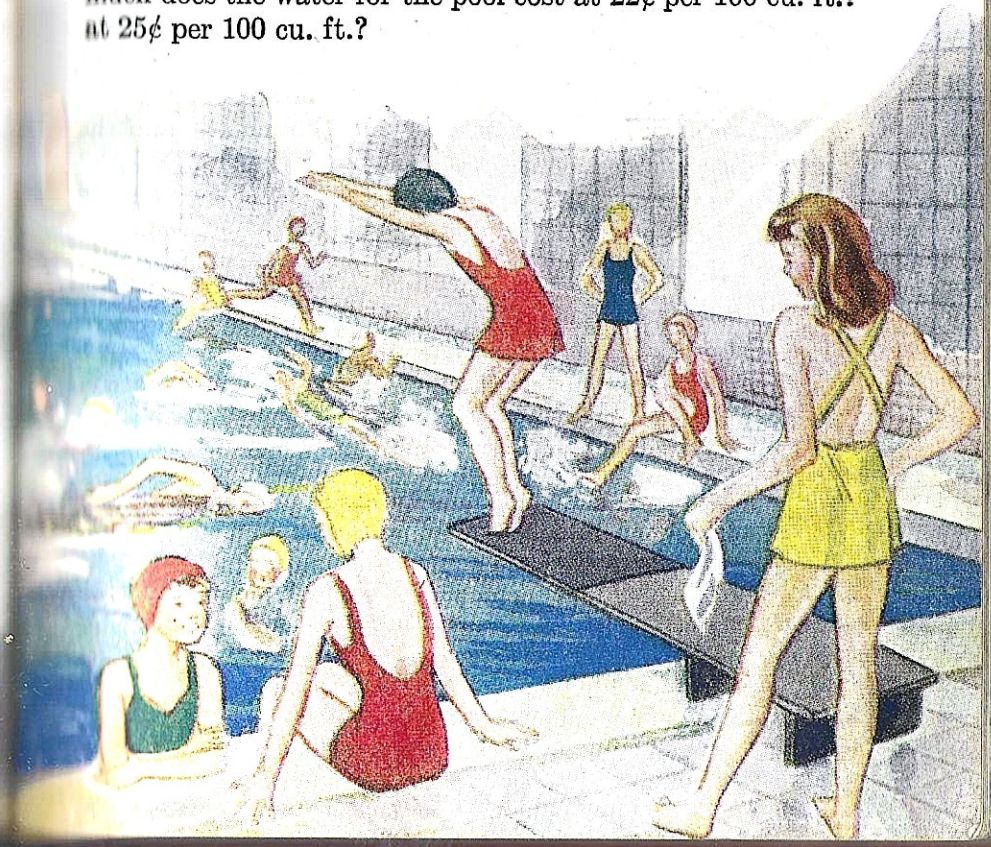


1. Our new high school has a swimming pool. The elementary school pupils use it once a week. The pool is 60 ft. long and 35 ft. wide. The water in the pool has an average depth of 6 ft. How many cubic feet of water are there in the pool? How many gallons of water are there if 1 cu. ft. of water equals about $7\frac{1}{2}$ gal.?

2. The cost of water in our city is 24¢ per 100 cu. ft. What does it cost to fill the high school pool to an average depth of 6 ft.? See ex. 1.

3. The janitor says that it saves money to fill the pool in ex. 1 to an average depth of $5\frac{1}{2}$ ft. instead of 6 ft. How much money does it save? See ex. 1 and 2.

4. The outdoor pool at the beach is 90 ft. long and 40 ft. wide. If it is filled to an average depth of 5 ft. 8 in., how much does the water for the pool cost at 22¢ per 100 cu. ft.? at 25¢ per 100 cu. ft.?



1. The pupils in Drake School issue a school paper called the *Drake News*. Henry is manager and treasurer. Henry asked Jack to put an advertisement in the paper about the bird-houses Jack makes and sells. The cost of an advertisement is 40¢ for $\frac{1}{2}$ page or 20¢ for $\frac{1}{4}$ page. Jack paid Henry 40¢ for a half-page advertisement. Then Henry made out this *receipt* and gave it to Jack:

April 24, 194—

Received from Jack Allen

No and $\frac{40}{100}$ Dollars

for advertising space

$ .40 Henry Bates, Treasurer

Henry has a receipt book containing printed receipts like the one above. Henry keeps a record in the receipt book of each receipt that he writes; this record shows the date, the amount received, the person who paid the money, and the reason for paying it. The receipt has the word "Dollars" printed on it, so Henry wrote 40¢ as "No and 40/100 Dollars." The word "No" makes it clear that there are no dollars. If the amount were $1.40, he would write "One and 40/100 Dollars."

2. On April 25 Henry received 20¢ from Ann West for a small advertisement of the hand-knit mittens that she sells. Write the receipt that Henry gave Ann.

Write receipts for these amounts that Henry received:

3. April 26, 40¢ from George Green for an ad for eggs.
4. April 27, 30¢ from Mary Case for an ad for candy.
5. April 29, 40¢ from John Lee for an ad for tie racks.
6. May 2, 10¢ from Alice Bates for a "lost" notice.



1. As manager and treasurer of the *Drake News* Henry orders supplies that are needed and pays the bills when they come in. A business house usually sends out bills on the first of each month. Here is a bill that Henry received on May 2:

ANDERSON AND COMPANY
STATIONERS

Sold to: Drake News
Henry Bates, Treasurer
420 Elm Street
Weston, Texas

Weston, May 1, 19—

| | | | | | | |
|---|---|---|---|---|---|---|
| April 3 | 3 pkg. paper | @ .87 | 2 | 61 | | |
| | 1 box stencils | @ 3.25 | 3 | 25 | | |
| | 2 typewriter ribbons | @ .65 | 1 | 30 | | |
| | 1 rubber stamp | @ .35 | | 35 | | |
| | | | | | 7 | 51 |

PAID
May 10, 19—
Anderson & Co.
Per C.J.F.

In the bill the sign @ means "at"; 3 pkg. paper @ .87 means 3 packages of paper at $.87 *each*.

2. Check the bill as Henry did to see that these amounts are correct: $2.61, $1.30, $7.51.

3. When Henry paid the bill, Anderson and Company stamped it "Paid." When a bill has been marked "Paid," it is called a *receipted bill*.

4. T. Jones sent *Drake News* a bill on June 1 for these purchases: May 14, 2 bottles paste @ 25¢; May 20, 1 account book @ 65¢, 2 bottles ink @ 15¢. Make out the bill.

5. Henry should keep all receipted bills carefully protected in a box or file. Can you tell why?

6. Perhaps your parents or a storekeeper you know will show you some receipted bills.

Use a ruler to draw bills and receipts like those on pages 248 and 249. Write the following bills and receipts. In the bills find the total cost of each article and the total amount of the bill. Make up the dates, names, and addresses:

1. A receipt for $5.00 for garage rent.

2. A bill for 6 lb. meat @ $.42; $\frac{1}{2}$ lb. butter @ $.52; $2\frac{1}{2}$ doz. eggs @ $.54; $4\frac{3}{4}$ lb. chicken @ $.46.

6 lb. meat @ $.42 means $.42 per pound. $\frac{1}{2}$ lb. butter @ $.52 means at $.52 per pound.

3. A bill for 4 baseballs @ $1.29; 2 baseball bats @ $1.75; 2 fielders' gloves @ $1.50; 1 catcher's mitt @ $2.50.

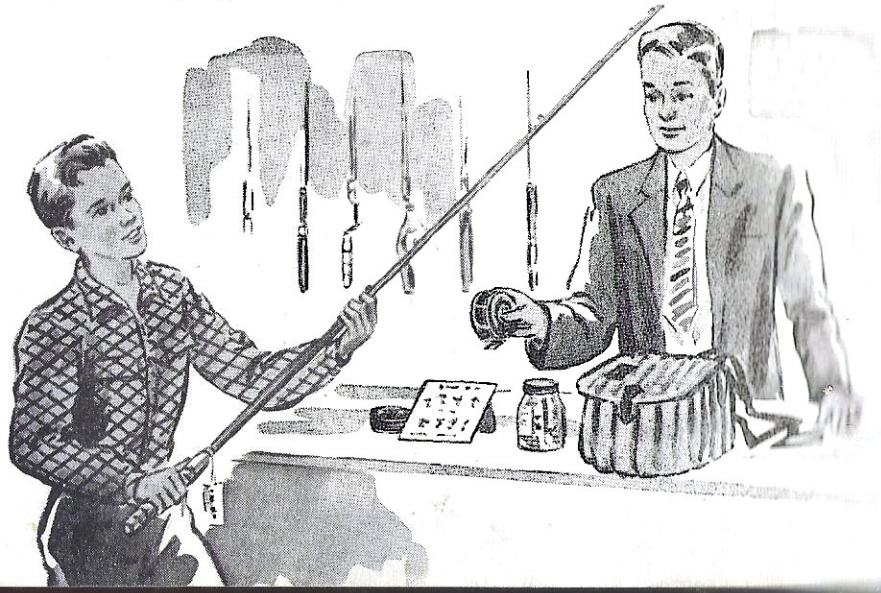
4. A receipt for $3.50 for a magazine subscription.

5. A bill for $4\frac{1}{2}$ yd. gingham @ $.39; 2 cards of buttons @ $.19; 2 patterns @ $.35; 3 pieces of trimming @ $.25. Receipt the bill.

6. A bill for 10 gal. gasoline @ $.21, 6 qt. oil @ $.35, $4\frac{3}{4}$ hr. labor on car @ $1.00, 2 spark plugs @ $.50.

7. A receipt for $75.00 for down payment on a used car.

8. A bill for 1 fishing rod @ $2.85; 1 reel @ $2.09; 2 lines @ $.79; 1 pr. fishing boots @ $4.89.





1. If $\frac{1}{4}$ in. represents 3 mi. on a scale drawing, how many miles are represented on the drawing by a line $2\frac{1}{2}$ in. long?

2. What part of a ton is 750 lb.? 1500 lb.?

3. At the Scout meeting there were 24 boys present. This was only $\frac{3}{4}$ of the boys who belong to the troop. How many boys belong to the troop?

4. If soap sells at 3 bars for $.25, how much does 1 doz. bars of soap cost?

5. Tom read in the newspaper that a fast airplane set a record for speed. It made 4 test runs at these speeds: 611 mi. an hour, 606 mi. an hour, 608 mi. an hour, and 602 mi. an hour. Find its average speed per hour.

6. Tom also read that another airplane of the same kind made 4 test runs at these speeds: 599 mi. an hour, 609 mi. an hour, 598 mi. an hour, and 607 mi. an hour. Find the average speed per hour of this plane.

7. If an airplane has a speed of 606 mi. an hour, find, to tenths of a mile, its speed in miles per minute.

8. Last year Mr. Ward spent $123.48 for gasoline for his car. He bought 563 gal. in all. Find, to the nearest cent, the average price per gallon of gasoline.

9. Find the volume of a box that is $1\frac{1}{2}$ ft. wide, $2\frac{3}{4}$ ft. long, and 8 in. deep.

10. Tom was at baseball practice $1\frac{1}{4}$ hr. on Monday, $1\frac{2}{3}$ hr. on Wednesday, $1\frac{3}{4}$ hr. on Thursday, and $1\frac{1}{2}$ hr. on Friday. How many hours was Tom at baseball practice?

11. Jim has saved $23.20 since Christmas. This is $8.75 more than Henry has saved in the same time. How much has Henry saved?

12. The average monthly temperatures for 6 months in Blair were: Sept., 79°; Oct., 63°; Nov., 52°; Dec., 50°; Jan., 44°; Feb., 42°. Show these facts by a line graph.

1. It took John 50 min. to walk $1\frac{1}{4}$ mi. to the top of the mountain. How many minutes did it take to walk 1 mi.?

2. This year Dorothy's grandmother had her sixty-ninth birthday. In what year was she born?

3. In 9 months last year the school children in a large city deposited $1,070,046 in school savings banks. What was the average amount deposited per month?

4. A large airplane left Washington, D. C. on Sept. 28 at 3:58 P.M. to fly around the world. It returned there on Oct. 4 at 9:42 P.M. How many days, hours, and minutes did the trip take? How many hours and minutes was that?

5. Margaret read that in the Empire State Building in New York there are more than 17,000,000 ft. of telephone and telegraph wire. How many miles of wire is this? Give the answer to the nearest whole mile.

6. A cargo plane took a load of household furnishings from New York to Los Angeles, California. The cargo weighed 18,500 lb. and the charge was $20 per 100 lb. What was the cost of shipping these household furnishings by air?

7. The household furnishings in ex. 6 belonged to four families who were moving from New York to California. How many tons did their furnishings weigh? What was the average cost of shipping for each family?

8. The 1940 census showed that the population of the United States at that time was 131,669,275. Five years later the population was estimated to be 139,621,430. What was the estimated 5-year increase? What was the average increase per year?

9. An airplane company is making plans to cut the time for a trip from New York to Buenos Aires to 22 hr. The route is 5671 mi. What would be the average speed per hour for this proposed trip? Give the answer to the nearest whole mile.



Addition Test 5a. Time: 4 min.

| | | | | | | |
|---|---|---|---|---|---|---|
| 1. 816 | 613 | 352 | 321 | 166 | | 451 |
| 359 | 256 | 540 | 457 | 574 | | 313 |
| 644 | 334 | 399 | 334 | 459 | | 699 |
| 587 | 968 | 484 | 263 | 222 | | 846 |
| 875 | 875 | 862 | 579 | 647 | | 430 |
| 124 | 711 | 209 | 270 | 812 | | 267 |
| 232 | 137 | 213 | 405 | 213 | ⑥ | 363 |

Addition Test 5b. Time: 4 min.

| | | | | | | |
|---|---|---|---|---|---|---|
| 2. 654 | 434 | 443 | 726 | 605 | | 446 |
| 341 | 127 | 381 | 645 | 591 | | 711 |
| 598 | 876 | 839 | 471 | 656 | | 365 |
| 734 | 758 | 726 | 158 | 928 | | 874 |
| 276 | 210 | 569 | 283 | 199 | | 298 |
| 423 | 945 | 702 | 904 | 230 | | 537 |
| 313 | 362 | 152 | 531 | 512 | ⑥ | 243 |

Addition Test 5c. Time: 4 min.

| | | | | | | |
|---|---|---|---|---|---|---|
| 3. 236 | 132 | 143 | 664 | 824 | | 563 |
| 587 | 462 | 277 | 269 | 462 | | 352 |
| 944 | 244 | 308 | 302 | 547 | | 992 |
| 475 | 685 | 933 | 590 | 758 | | 141 |
| 850 | 757 | 165 | 715 | 241 | | 649 |
| 382 | 326 | 711 | 858 | 389 | | 910 |
| 121 | 303 | 424 | 251 | 632 | ⑥ | 377 |

Improvement Tests.

## THE LANGUAGE OF ARITHMETIC

Show that you know what each word or phrase means:

| | | |
|---|---|---|
| 4. invert | 8. balance | 12. point off |
| 5. receipt | 9. billion | 13. cubic inch |
| 6. cancel | 10. line graph | 14. annex zeros |
| 7. volume | 11. pictograph | 15. nearest tenth |

1. You have learned that you can change 2 ft. 6 in. to inches. 2 ft. = 24 in. 24 in. + 6 in. = 30 in. This shows that 2 ft. 6 in. = 30 in.

2. You can also change 76 in. to feet and inches by dividing 76 by 12. 76 in. = 6 ft. 4 in.

3. Numbers like 7 ft. or 2 qt. are called *denominate numbers*. Numbers with two or more units, like 7 ft. 3 in. and 5 gal. 2 qt., are called *compound denominate numbers*.

4. You need to know the tables of measure in order to work with denominate numbers. Study the tables on page 307 if you do not know them.

Tell the number that goes in each space:

5. 6 lb. 4 oz. = . . . oz. 35 qt. = . . . bu. . . . qt.
6. 3 pk. 2 qt. = . . . qt. 82 in. = . . . yd. . . . in.
7. 6 qt. 1 pt. = . . . pt. 80 hr. = . . . da. . . . hr.
8. 8 ft. 7 in. = . . . in. 50 oz. = . . . lb. . . . oz.
9. 5 hr. 11 min. = . . . min. 90 min. = . . . hr. . . . min.

10. At the end of each week Bob is paid for the time he works for Mr. Brown. This week he worked these times on different days: 1 hr. 10 min.; 40 min.; 1 hr. 25 min.; 2 hr. 30 min. Find the total time Bob worked this week.

Add the minutes, which gives 105 min. Then add the hours, which gives 4 hr. The sum is 4 hr. 105 min. But 105 min. can be changed to 1 hr. 45 min. So 4 hr. 105 min. becomes 5 hr. 45 min. Bob worked 5 hr. 45 min. in all.

```
1 hr.  10 min.
       40 min.
1 hr.  25 min.
2 hr.  30 min.
4 hr. 105 min.  = 5 hr. 45 min.
```

11. Find the sum of 3 yd. 10 in., 4 yd. 18 in., 5 yd. 7 in., and 3 yd. 22 in.



1. Jack sold one chicken weighing 3 lb. 10 oz. and another chicken weighing 4 lb. 9 oz. How much did the two chickens together weigh?

2. Elizabeth ordered three articles by mail. The shipping weight of the dress was 1 lb. 5 oz.; of the hat, 14 oz.; and of the coat, 3 lb. 8 oz. Find the total shipping weight.

Add. Check by going over the work:

| | | |
|---|---|---|
| 3. 6 ft. 9 in. | 4 lb. 12 oz. | 7 min. 32 sec. |
| 5 ft. 7 in. | 3 lb. 7 oz. | 9 min. 45 sec. |
| 2 ft. 3 in. | 5 lb. 2 oz. | 3 min. 18 sec. |
| 4. 3 yd. 1 ft. | 3 da. 16 hr. | 4 gal. 1 qt. |
| 7 yd. 2 ft. | 4 da. 15 hr. | 7 gal. 3 qt. |
| 2 yd. 1 ft. | 6 da. 18 hr. | 5 gal. 2 qt. |

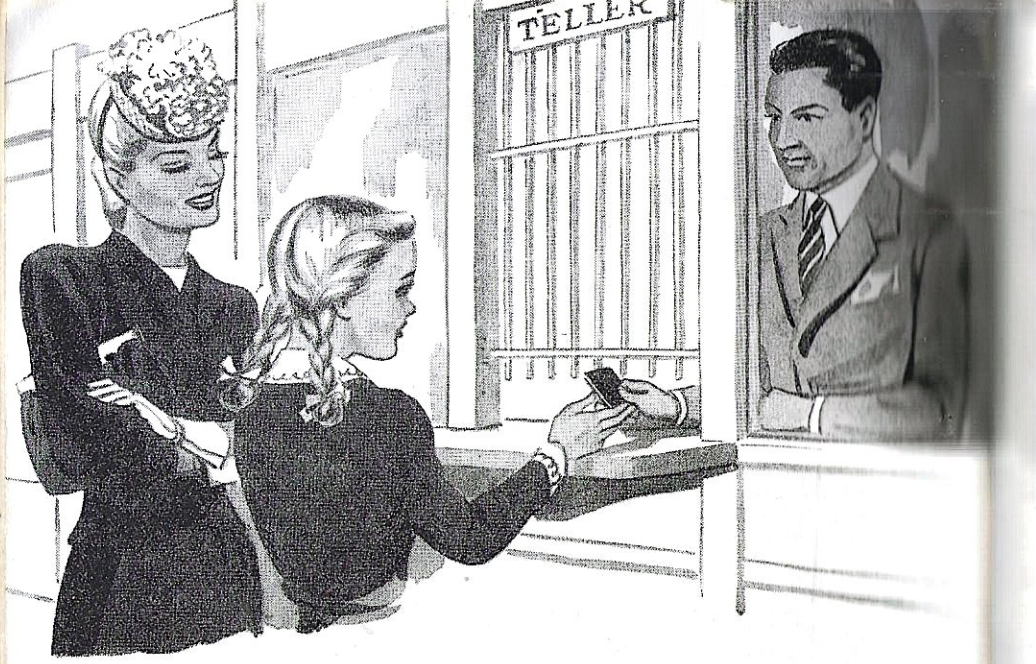
5. Miss Lee had 5 yd. 9 in. of gingham. She made an apron that took 1 yd. 24 in. How much gingham did Miss Lee have left?

You cannot subtract 24 in. from 9 in. so change 5 yd. 9 in. to 4 yd. 45 in. Then you can subtract 24 in. from 45 in. and 1 yd. from 4 yd. Miss Lee had 3 yd. 21 in. of gingham left.

```
5 yd.  9 in. = 4 yd. 45 in.
1 yd. 24 in. = 1 yd. 24 in.
               3 yd. 21 in.
```

Subtract. Check by going over the work:

| | | |
|---|---|---|
| 6. 8 lb. 14 oz. | 6 bu. 1 pk. | 6 ft. |
| 2 lb. 10 oz. | 4 bu. 3 pk. | 4 ft. 8 in. |
| 7. 4 yd. 1 ft. | 8 hr. 40 min. | 9 hr. |
| 3 yd. 2 ft. | 3 hr. 32 min. | 2 hr. 35 min. |
| 8. 9 yd. 4 in. | 7 qt. | 3 da. 11 hr. |
| 6 yd. 9 in. | 3 qt. 1 pt. | 1 da. 20 hr. |




## SAVING MONEY

1. Mary had been saving money for several weeks. She did not have a good place to keep the money at home so one day she went to the savings bank with her mother to open a savings account.

Deposit
FRANKLIN BANK
Name Mary Wilson
Address 144 Maple St.
Book No. 973 Date Apr. 14, 19-

| | | |
|---|---|---|
| Bills | 1 | 00 |
| Coin | | 25 |
| Checks | | |
| | | |
| | | |
| Total | 1 | 25 |

2. At the bank Mary had to fill out a card giving her name and address. She also filled out a *deposit slip* like the one at the left which shows how much money she *deposited*. When the deposit slip was filled out, Mary handed it and the money to the man behind the window who is called the *teller*. Every time that Mary brings money to the savings bank, she must make out a deposit slip which she hands to the teller with her money. If Mary leaves her money in the bank long



enough, the bank will pay her a small amount, called *interest*, for the use of the money. In some savings banks interest is paid every 3 months; in other savings banks interest is paid every 6 months.

3. When the teller received Mary's money and the deposit slip he gave her a *deposit book* upon which he wrote her name and address. On the first page of the book the teller wrote the date and the amount of her deposit. Mary brings her deposit book with her each time she deposits money in the bank. If Mary should take out, or *withdraw*, any money, she must also bring her deposit book so that the teller can write the amount she withdraws in the book.

4. Mary's first deposit was $1.25 and was made on April 14. On April 21, she made another deposit of $1.10. How much did she have in the savings bank then? The $1.10 that Mary deposited on April 21 was 1 half dollar, 2 quarters, and 1 dime. Make a deposit slip like the one on page 256 for the deposit of April 21.

5. Mary deposited $.85 on April 29, $1.15 on May 10, and $.95 on May 15. The $1.15 was 1 dollar bill and 3 nickels. Write the three deposit slips she made on these dates. How much money did she have in the bank after her deposit of May 15?

6. On May 19, Mary withdrew $1.25 from the bank to buy a book. How much did she have in the bank after that?

7. Mary received $5.00 for her birthday on May 29 and on June 4 she deposited this gift and $1.75 more in the bank. She had 1 five-dollar bill, 1 dollar bill, and 3 quarters. Write the deposit slip Mary wrote on June 4. How much did she have in the bank then?

8. Get a deposit slip from a savings bank in your city and bring it to class.

9. If the schools in your city have a school savings bank, find out how many pupils are depositors and the total amount of their deposits.

| Age | Standing Broad Jump | | Running Broad Jump | | 50-Yard Dash | | Ball Throw Free Style | |
|---|---|---|---|---|---|---|---|---|
| | Boys | Girls | Boys | Girls | Boys | Girls | Boys | Girls |
| 11 | 4′ 10″ | 4′ 2″ | 8′ 3″ | 6′ 6″ | $8\frac{3}{5}$ sec. | $9\frac{1}{5}$ sec. | 38′ | 30′ |
| 12 | 5′ 0″ | 4′ 4″ | 9′ 3″ | 7′ 0″ | $8\frac{1}{5}$ sec. | 9 sec. | 46′ | 32′ |
| 13 | 5′ 2″ | 4′ 6″ | 10′ 0″ | 7′ 2″ | 8 sec. | $8\frac{4}{5}$ sec. | 54′ | 32′ |
| 14 | 5′ 6″ | 4′ 8″ | 10′ 6″ | 7′ 6″ | $7\frac{4}{5}$ sec. | $8\frac{3}{5}$ sec. | 60′ | 38′ |

1. The table shows that a boy of 11 should be able to jump 4 ft. 10 in. in the standing broad jump, to run 50 yd. in $8\frac{3}{5}$ sec., and to throw a ball 38 ft. These records are called "age standards" for each event. What are the standards for a girl of 11 in each event? In each event do boys of 11 do better or worse than girls of 11?

2. Look at the standards for age 12 for the standing broad jump. How much farther should a boy of 12 jump than a girl of 12?

3. For age 12 how much better do boys do than girls in the running broad jump? in the 50-yard dash? in the ball throw? To answer these questions, look in the table.

4. Ann is 13 yr. old. She can throw a ball 42 ft. Ann's record is how much better than the standard for her age?

5. For age 14 how many seconds longer does it take a girl than a boy to run 50 yd.?

6. At which age is there the least difference in time for boys and girls in the 50-yard dash?

7. Yesterday in the running broad jump Betty jumped 8 ft. 4 in. She is 12 yr. old. How much farther did Betty jump than the standard for her age given in the table?

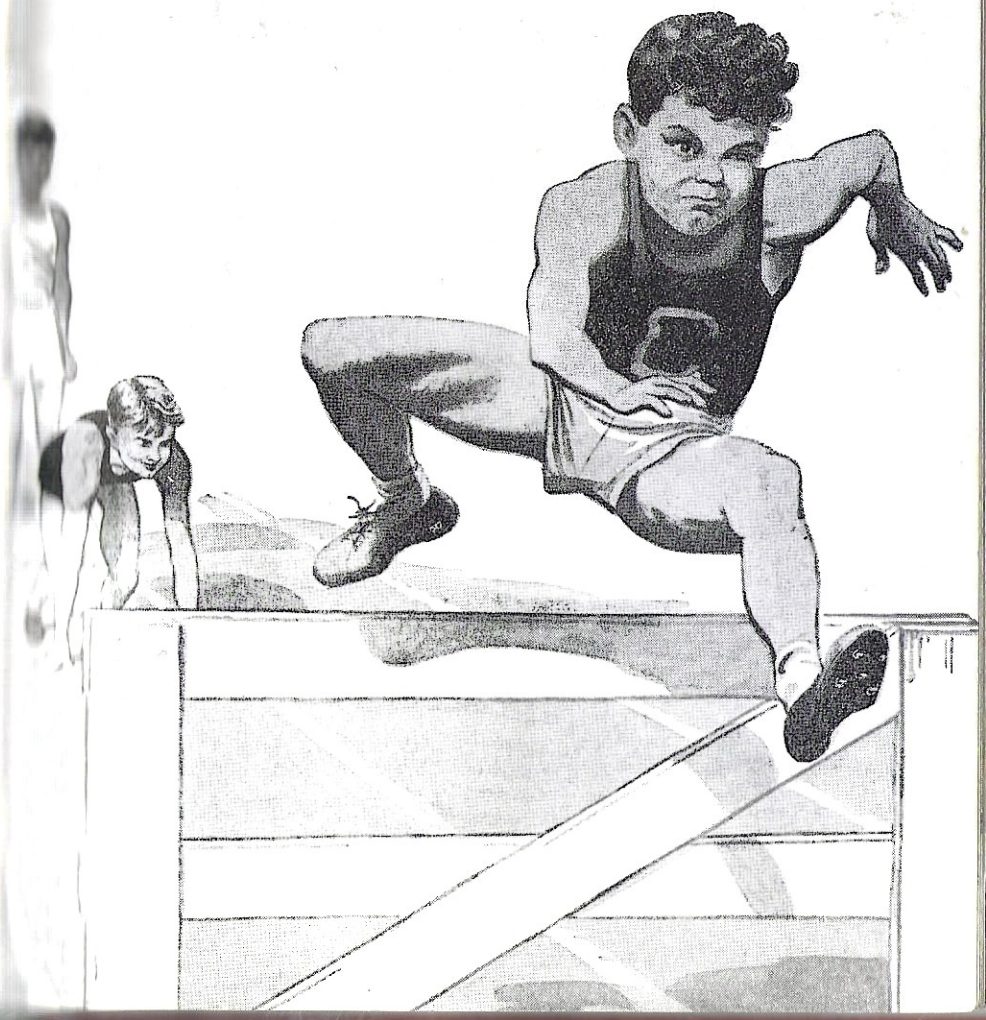
8. How much farther should a boy of each age jump in a standing broad jump than a girl of the same age?

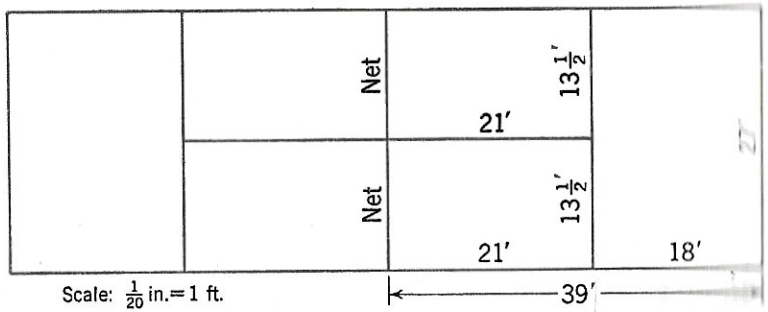
9. Tom, who is 11, ran 50 yd. in $8\frac{1}{10}$ sec. How much less time was that than the standard for his age?

10. Bill is 14 yr. old. He threw a ball 55 ft. 9 in. How close did he come to the 14-year-old standard?

11. Dick is 11 yr. old and Joe is 14 yr. old. Dick jumped 9 ft. 1 in. in the running broad jump and Joe jumped only 8 ft. 8 in. How much farther did Dick jump than Joe? Is each boy up to the standard for his age?

12. Find how far you can jump and throw a ball and how long it takes you to run 50 yd. Then look in the table and compare your records with the standards for your age.

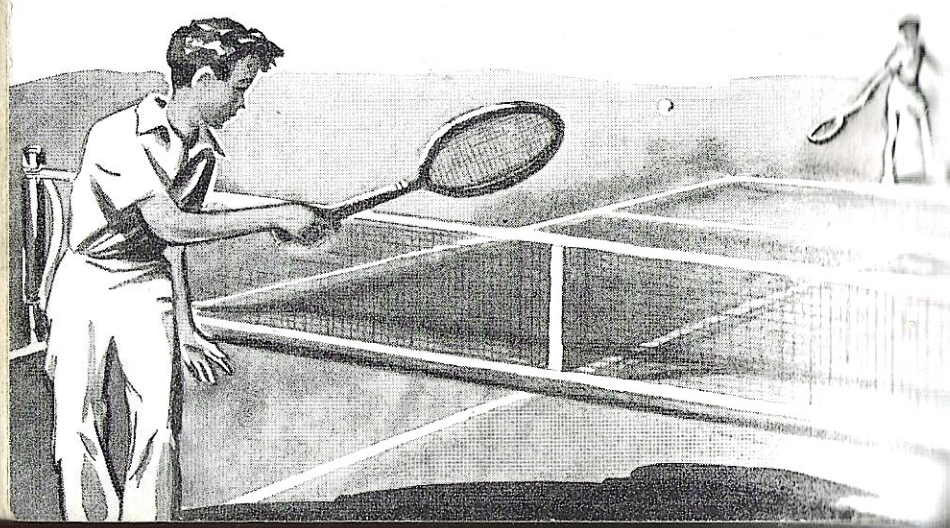





1. This is a scale drawing of a tennis court. It has been drawn to a scale of $\frac{1}{20}$ in. = 1 ft. so that the entire court can be shown on this page. The length of each line in feet is shown on the drawing. Your ruler is not marked in 20ths of an inch but engineers use such rulers.

2. On a sheet of paper draw a tennis court to scale, letting $\frac{1}{8}$ in. = 1 ft. The court is 78′ long. How many inches represent 78′? It is 27′ wide. How many inches represent 27′? How many inches represent 21′? 18′? $13\frac{1}{2}$′?

3. Using a scale of $\frac{1}{16}$″ = 1′, draw the tennis court again. How many inches represent 78′ now? How many inches represent 27′? 21′? 18′? $13\frac{1}{2}$′? How does this drawing compare with the one you made in ex. 2?





Subtraction Test 5a. Time: 5 min.

| | | | |
|---|---|---|---|
| 1. 736273 | 480666 | 300497 | 654909 |
| 644859 | 69683 | 103852 | 85668 |
| 2. 316180 | 310770 | 265482 | 386425 |
| 28647 | 263475 | 70583 | 145663 |
| 3. 654943 | 891632 | 915838 | 427278 |
| 86328 | 452159 | 88153. | ⑫352696 |

Subtraction Test 5b. Time: 5 min.

| | | | |
|---|---|---|---|
| 4. 245200 | 400009 | 282931 | 717528 |
| 11298 | 38521 | 174158 | 355863 |
| 5. 175168 | 716152 | 438410 | 736749 |
| 76632 | 221259 | 45533 | 185863 |
| 6. 364905 | 327938 | 118413 | 423126 |
| 79553 | 251369 | 13685 | ⑫ 68679 |

Subtraction Test 5c. Time: 5 min.

| | | | |
|---|---|---|---|
| 7. 554466 | 736038 | 701000 | 316239 |
| 381737 | 42585 | 452837 | 144609 |
| 8. 279372 | 145058 | 195684 | 618761 |
| 84623 | 95226 | 124785 | 53583 |
| 9. 422564 | 301770 | 722349 | 249193 |
| 103656 | 106483 | 681493 | ⑫ 73859 |

Improvement Tests.

Find the answers. Watch the signs:

| | | | |
|---|---|---|---|
| 1. $3\frac{5}{8} + 2\frac{1}{4}$ | $\frac{7}{12} \div \frac{5}{6}$ | $3\frac{2}{3} - 2\frac{1}{6}$ | $2\frac{5}{6} + 3\frac{1}{4}$ |
| 2. $12 - 9\frac{2}{3}$ | $8 \times \frac{3}{4}$ | $1\frac{3}{4} + 2\frac{3}{4}$ | $15 \div 3\frac{1}{6}$ |
| 3. $2\frac{2}{5} \times \frac{15}{16}$ | $\frac{9}{10} + \frac{4}{5}$ | $16 \times 1\frac{1}{3}$ | $6\frac{1}{2} \times 10$ |
| 4. $7\frac{5}{6} + 4\frac{1}{2}$ | $1 \div \frac{5}{6}$ | $\frac{3}{4} \div 1\frac{1}{2}$ | $\frac{9}{16} \div 12$ |
| 5. $2\frac{1}{8} - 1\frac{1}{2}$ | $\frac{9}{16} \times \frac{2}{3}$ | $4\frac{2}{3} \div \frac{7}{12}$ | $12 + 3\frac{3}{4}$ |
| 6. $\frac{11}{12} \times 9\frac{3}{5}$ | $\frac{7}{8} - \frac{3}{4}$ | $3\frac{1}{3} + 2\frac{1}{3}$ | $4\frac{1}{2} \div 1\frac{3}{4}$ |
| 7. $4\frac{1}{2} + 2\frac{3}{5}$ | $9 \div \frac{3}{4}$ | $6\frac{1}{2} - 2\frac{7}{10}$ | $2\frac{1}{2} \times 1\frac{1}{6}$ |
| 8. $3\frac{1}{4} - 1\frac{7}{16}$ | $\frac{1}{2} + \frac{2}{3}$ | $3\frac{3}{10} \div 1\frac{1}{5}$ | $4\frac{5}{16} + 3\frac{7}{16}$ |
| 9. $12 \times 1\frac{3}{5}$ | $1 - \frac{3}{5}$ | $4\frac{9}{16} - 1\frac{3}{16}$ | $8\frac{3}{10} - 2\frac{9}{10}$ |

Multiply and check:

| | | | | | | |
|---|---|---|---|---|---|---|
| 10. | 1.38 | 62.5 | .18 | .02 | 280 | 17.25 |
| | 42 | .8 | .3 | .4 | 2.5 | 3.9 |
| 11. | 63.2 | 125 | 1.1 | .07 | 2.37 | 6.125 |
| | .04 | .007 | .09 | .6 | 1.7 | 12 |

Divide and check:

| | | | | | |
|---|---|---|---|---|---|
| 12. | .6)$\overline{.012}$ | .8)$\overline{3.44}$ | 4)$\overline{22.3}$ | .16)$\overline{60.8}$ | .007)$\overline{24.5}$ |
| 13. | 5)$\overline{8.17}$ | 9)$\overline{.027}$ | .15)$\overline{.795}$ | 23)$\overline{.368}$ | .012)$\overline{.204}$ |

Add and check:

| | | | |
|---|---|---|---|
| 14. | 2.63 | 16.32 | 4662.8 |
| | 8.37 | 28.50 | 2834.5 |

Subtract and check:

| | | | |
|---|---|---|---|
| 15. | 9.90 | 10.85 | 6004.2 |
| | 2.35 | 9.99 | 1309.7 |

1. How much less is the cost of 8 balls of yarn at \$.59 each than the cost of 8 balls of yarn at \$.74 each?

2. The rainfall in Mayfield for each month last year was as follows: 7.76 in., 3.92 in., 3.83 in., 2.68 in., .45 in., 3.88 in., 3.18 in., 2.90 in., 1.43 in., 1.68 in., .92 in., 4.33 in. Find the average monthly rainfall.

3. If 2 oz. of candy cost 5¢, what will 1 lb. cost?

4. Mr. Baker finds that he can drive his car about 16 mi. on 1 gal. of gasoline. If he has 15 gal. in the tank, about how many miles can he drive on that amount?

5. George earns \$.95 a week. How many weeks will it take him to save \$20 if he spends \$.15 each week?

6. A large radio costs \$275. A small radio costs \$25. How many times as much as the small radio does the large radio cost?

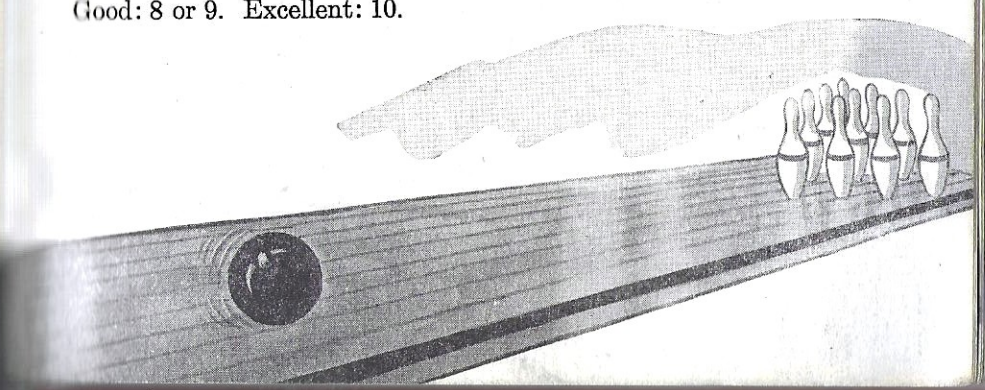
7. Mrs. Smith had \$.74 left when she came home from the store. She had spent \$2.63 for meat and \$1.70 for groceries. How much money did she have before she went to the store?

8. If you run around a block that measures 200 ft. by 240 ft., what part of a mile do you run?

9. Find the cost of 1 yd. of ribbon if $\frac{3}{4}$ yd. costs 45¢.

10. A swimming pool is 60 ft. long and 30 ft. wide. How many cubic feet of water will it hold when it is filled with water to an average depth of 6 ft.?

Poor: 0 to 5 right. Fair: 6 or 7.
Good: 8 or 9. Excellent: 10.



1. A box is $2\frac{1}{4}$ ft. wide, $4\frac{1}{4}$ ft. long, and $1\frac{1}{3}$ ft. deep. How many cubic feet does the box contain?

2. Peter is planning to make a scale drawing of his garden which is 14 ft. by 20 ft. He will use the scale of $\frac{1}{4}$ in. = 1 ft. Make a scale drawing of Peter's garden, using his scale.

3. An aquarium is 22 in. long and 14 in. wide. It is filled with water to a depth of 9 in. If a gallon of water occupies 231 cu. in., how many gallons of water are there in the aquarium?

4. Write a receipt to Fred King for $12.00. He paid you that amount on May 18 for your old bicycle.

5. How many hours and minutes is it from 9:18 P.M. Friday to 1:03 P.M. Saturday?

6. Write a bill to Mrs. James Lee for 3 pr. stockings @ $.89; 6 handkerchiefs @ $.49; 7 yd. muslin @ $.22.

7. How many inch cubes can be placed in a box with inside measurements of 1 ft. × 2 in. × 1 ft. 4 in.?

Add. Check by going over the work:

| | | |
|---|---|---|
| 8. 6 hr. 12 min. | 14 ft. 8 in. | 4 lb. 9 oz. |
| 2 hr. 35 min. | 10 ft. 9 in. | 3 lb. 12 oz. |
| 1 hr. 50 min. | 11 ft. 7 in. | 7 lb. 14 oz. |
| 9. 3 hr. 45 min. | 7 yd. 6 in. | 3 pk. 3 qt. |
| 4 hr. 18 min. | 9 yd. 4 in. | 1 pk. 6 qt. |
| 6 hr. 22 min. | 6 yd. 8 in. | 2 pk. 5 qt. |

Subtract. Check by going over the work:

| | | |
|---|---|---|
| 10. 4 min. 10 sec. | 8 yd. | 6 bu. 2 pk. |
| 1 min. 25 sec. | 5 yd. 9 in. | 4 bu. 1 pk. |
| 11. 9 min. 14 sec. | 6 gal. | 9 ft. 3 in. |
| 6 min. 38 sec. | 4 gal. 3 qt. | 7 ft. 7 in. |



If you miss more than one example in any row, turn to the Practice Page for that row.

| | | PRACTICE PAGES |
|---|---|---|
| Find the areas of rectangles with these dimensions: | | |
| 1. 6 ft. × 8 ft. 2 in. | 10 ft. × 16 ft. 6 in. | 108 |
| 2. 9 in. × 2 ft. 8 in. | 12 yd. × 15 yd. 2 ft. | 108 |
| Find the volumes of boxes with these dimensions: | | |
| 3. 3″ × 5″ × 7″ | 1″ × 6″ × $2\frac{1}{2}$″ | 241 |
| 4. 2″ × 8″ × $1\frac{1}{2}$′ | 5′ × 9′ × 16″ | 242 |
| Tell what number to put in each space: | | |
| 5. 5 sq. yd. = .. sq. ft. | 1 sq. ft. = .. sq. in. | 109 |
| 6. 2 sq. ft. = .. sq. in. | $1\frac{1}{4}$ A. = .. sq. ft. | 109 |
| 7. 6 sq. ft. = .. sq. yd. | 1 sq. mi. = .. acres | 109 |
| 8. 2 cu. yd. = .. cu. ft. | 18 cu. ft. = .. cu. yd. | 243 |

Find the answers:

9. Find the cost of laying a cement walk 5 ft. by 72 ft. at $2.50 a square yard. 110

10. Fred has a box-shaped can of oil measuring 6″ × 7″ × 11″. How many gallons of oil will it hold? 231 cu. in. = 1 gal. 244

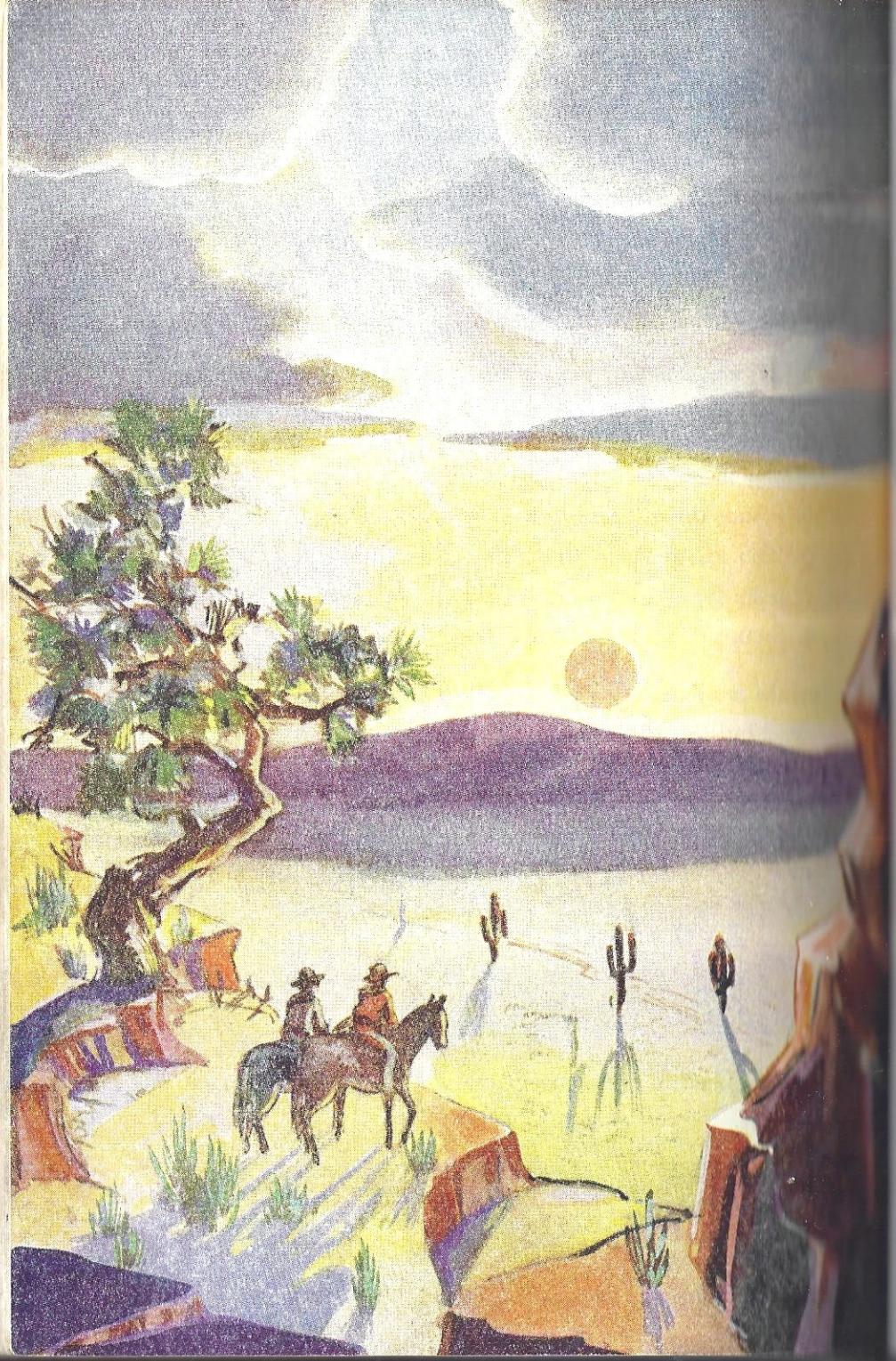
Add. Check by going over the work:

| | | |
|---|---|---|
| 11. 4 yd. 1 ft. | 9 min. 40 sec. | 255 |
| 6 yd. 2 ft. | 3 min. 27 sec. | |
| 3 yd. 2 ft. | 8 min. 32 sec. | |

Subtract. Check by going over the work:

| | | |
|---|---|---|
| 12. 6 qt. | 6 lb. 5 oz. | 255 |
| 3 qt. 1 pt. | 2 lb. 9 oz. | |

Diagnostic test.



CHAPTER EIGHT

# Percentage and Review

## SUNRISE AND SUNSET

1. In air navigation, time is reckoned on a 24-hour basis, without using the abbreviations A.M. and P.M. On the 24-hour basis the hours are counted from 0 to 24. 0 is midnight; 3 is 3:00 A.M.; 6 is 6:00 A.M.; 12 is noon; 13 is 1:00 P.M.; 18 is 6:00 P.M.; 23 is 11:00 P.M. All hours greater than 12 are in the afternoon and evening. Hours and minutes are written as usual. 9:30 means 9:30 A.M.; 17:45 means 5:45 P.M.; 20:50 means 8:50 P.M. Read these hours and tell what each would be by your time using A.M. and P.M.: 8:40; 14:15; 15:10; 19:00; 0:05; 10:27; 21:15; 16:08; 4:43; 22:53; 7:25.

*To change 24-hour time to your time, subtract 12 if the hour is 13 or more.* Thus, 15:18 becomes 3:18 P.M.

2. This table shows when the sun rises and sets at six cities. The hours are given on the 24-hour basis.

| City and Latitude | | June 22 | | December 22 | |
|---|---|---|---|---|---|
| | | Rises | Sets | Rises | Sets |
| New Orleans | 30° | 5:00 | 19:05 | 6:52 | 17:05 |
| Columbus, O. | 40° | 4:31 | 19:32 | 7:19 | 16:38 |
| Winnipeg | 50° | 3:50 | 20:12 | 7:56 | 16:01 |
| Seward, Alaska | 60° | 2:35 | 21:27 | 9:03 | 14:54 |
| Nome, Alaska | 64° | 1:31 | 22:32 | 9:53 | 14:04 |
| Barrow, Alaska | 72° | 24 hr. of daylight | | 24 hr. of night | |

On June 22 how many hours of daylight are there at New Orleans? at Columbus, which is farther north?

1. Winnipeg, Canada, is north of Columbus. Look in the table on page 267 and tell how many hours of daylight Winnipeg has on June 22. Before subtracting 3:50 from 20:12, change 20:12 to 19:72. Why?

2. On June 22, how many hours of daylight are there at Seward? at Nome? At Barrow the sun does not set on June 22, so Barrow has 24 hr. of daylight that day.

3. Compare the answers for ex. 1 and 2 with those for ex. 2 on page 267. On June 22, as you go north in the United States and Canada, do the days get longer or shorter?

4. On December 22, find the number of hours of daylight at each city in the table on page 267. On December 22, as you go north, are the days getting longer or shorter? At what place on December 22 is it night for the 24 hr.?

5. In raising crops the growing season is the number of days from the last killing frost in the spring to the first killing frost in the fall. At Fairbanks, Alaska, the growing season averages 89 days during which there is an average of 19.1 hr. of daylight per day. How many hours of daylight in all does Fairbanks have during its growing season?

6. At Minot, North Dakota, which is considerably south of Fairbanks, the growing season averages 116 days during which there is an average of 14.9 hr. of daylight per day. How many hours of daylight in all does Minot have during its growing season?

7. Is there much difference between the answers to ex. 5 and 6? You see that the long days at Fairbanks make up for the short growing season so that a plant gets about as much daylight during the total growing season at Fairbanks as it would in a place farther south where the growing season is longer but the days are shorter. In summer in the north the land does not cool much at night, due to the short nights; this also favors the rapid growth of crops.



1. You learned to write the common fraction $\frac{27}{100}$ as .27 which is a decimal. There is a third way to write $\frac{27}{100}$ which is 27%. You read it 27 *per cent*. The sign % means *per cent* or *hundredths*.

Here are four ways of writing hundredths:

$$\frac{27}{100} = .27 = 27\% = 27 \text{ per cent}$$
$$\frac{4}{100} = .04 = 4\% = 4 \text{ per cent}$$

When you write hundredths by means of the per cent sign you are using *percentage*. Percentage is used in business, in science, and in industry. You often see per cents in newspapers and magazines.

Read these statements:

2. Jack saved 20% on the price of a suit of clothes by buying it at a sale.

3. About 78% of the pupils in the Weston schools have money in the school savings bank.

4. This year the cost of eggs is 10% higher than it was at the same time last year.

5. Last week our attendance record at school was 98%.

6. Last winter on the day of the big snowstorm our attendance record was only 53%.

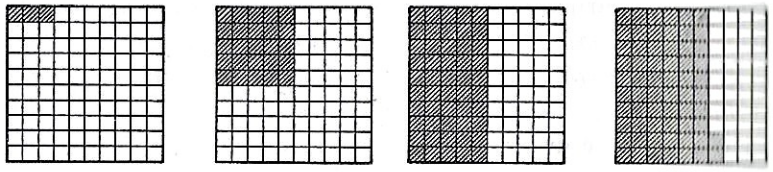
7. Bob's father told Bob that he should put in the bank at least 10% of the money he earns.

8. The school nurse says that in our school 23% of the pupils wear glasses.

9. The nurse also says that in our school 18% of the pupils are underweight.

10. John says he will try to get a mark of 100% on his arithmetic test next week.

11. When Mary bought a railroad ticket to Boston she paid a tax of 15% on the ticket.



*A* *B* *C* *D*

1. How many small squares are there in each large square? What part of each large square is each small square? What per cent of each large square is each small square?

2. In square *A* how many small squares are shaded? What per cent of square *A* is shaded? How many small squares in *A* are white? What per cent of *A* is white?

3. Look at squares *B*, *C*, and *D*. What per cent of each square is shaded? What per cent of each is white?

4. Draw a square making each side 5 in. long. Divide each side into 10 equal parts by marking off every $\frac{1}{2}$ in. Draw lines dividing your large square into small squares so that it looks like those above. How many small squares have you made? Shade 35% of your large square. What per cent of the large square is not shaded?

5. Suppose your father buys a sheet of 100 stamps at the post office. He uses 4 stamps on Monday, 8 on Tuesday, 15 on Wednesday, 3 on Thursday, 19 on Friday, and 1 on Saturday. Tell what per cent of the 100 stamps he used each day. Tell what per cent he used all together on the 6 days. Tell what per cent of the stamps he had left.

1. Since a per cent can always be written as a decimal you do not need to learn new rules for adding, subtracting, multiplying, and dividing in percentage problems. You work percentage problems by changing the per cents to decimals, using the rules you have learned for decimals.

Write each of these as decimals:

| | | | | | | |
|---|---|---|---|---|---|---|
| 2. | 12% | 2% | 6% | 53% | 1% | 19% |
| 3. | $\frac{28}{100}$ | $\frac{6}{100}$ | $\frac{1}{100}$ | $\frac{90}{100}$ | $\frac{3}{100}$ | $\frac{36}{100}$ |

4. 5 per cent 33 per cent 75 per cent

Write each of these with the sign %:

| | | | | | | |
|---|---|---|---|---|---|---|
| 5. | .25 | .60 | .03 | .07 | .01 | .49 |
| 6. | $\frac{15}{100}$ | $\frac{50}{100}$ | $\frac{4}{100}$ | $\frac{1}{100}$ | $\frac{9}{100}$ | $\frac{73}{100}$ |

7. The school paper states today that our baseball team has played 20 games this spring and has won 85% of them. How many games has our team won?

This means that 85% of 20 games have been won by our team. Another way to write 85% of 20 is .85 × 20. Multiplying 20 by .85 you get 17.00 which is the same as 17. So 17 games have been won by our baseball team. Check the work by going over it.

```
   20
  .85
 1 00
16 0
17.00
```

To find a per cent of a number, change the per cent to a decimal and multiply.

1. You know that 85% of 20 means .85 × 20. What does 28% of 75 mean? How much is 28% of 75?

Tell the number to put in each space:

2. 14% of 250 means . . . × 250, which equals . . .
3. 5% of 180 means . . . × 180, which equals . . .
4. 1% of 400 means . . . × 400, which equals . . .

5. In an arithmetic test on the 100 multiplication facts Mary got 93% right. How many are 93% of 100? How many answers did Mary have right?

6. In a test of 20 problems Jack worked 95% correctly. How many problems did Jack work correctly?

7. In a science test there were 25 questions. Betty had 80% of the answers right. How many questions did Betty answer correctly?

Find these per cents:

| | | |
|---|---|---|
| 8. 20% of 45 | 5% of $280 | 32% of $1000 |
| 9. 50% of 98 | 2% of $650 | 45% of $2440 |
| 10. 25% of 48 | 8% of $275 | 18% of $1550 |
| 11. 60% of 35 | 6% of $950 | 90% of $2800 |
| 12. 82% of 50 | 1% of $600 | 26% of $6000 |
| 13. 24% of 75 | 7% of $300 | 15% of $3680 |
| 14. 85% of 80 | 4% of $725 | 33% of $8000 |
| 15. 12% of 25 | 9% of $500 | 50% of $2384 |
| 16. 40% of 90 | 3% of $200 | 14% of $1750 |
| 17. 15% of 60 | 8% of $450 | 12% of $2000 |
| 18. 30% of 20 | 5% of $120 | 20% of $1635 |
| 19. 16% of 75 | 7% of $900 | 17% of $1500 |



Multiplication Test 5a. Time: 4 min. after copying.

| | | | |
|---|---|---|---|
| 1. 1875 | 5617 | 4923 | 7042 |
| 239 | 408 | 517 | ④ 463 |

Multiplication Test 5b. Time: 4 min. after copying.

| | | | |
|---|---|---|---|
| 2. 5067 | 6178 | 2849 | 1869 |
| 276 | 349 | 805 | ④ 362 |

Multiplication Test 5c. Time: 4 min. after copying.

| | | | |
|---|---|---|---|
| 3. 2574 | 4938 | 1685 | 2739 |
| 618 | 574 | 329 | ④ 809 |

Division Test 5a. Time: 6 min. after copying.

| | | |
|---|---|---|
| 4. 44)278432 | 62)354560 | 56)216160 |
| 5. 28)112168 | 75)180536 | ⑤ |

Division Test 5b. Time: 6 min. after copying.

| | | |
|---|---|---|
| 6. 19)136430 | 34)102306 | 29)161588 |
| 7. 53)101018 | 62)455961 | ⑤ |

Division Test 5c. Time: 6 min. after copying.

| | | |
|---|---|---|
| 8. 81)405162 | 25)194550 | 59)290710 |
| 9. 47)307709 | 38)269441 | ⑤ |

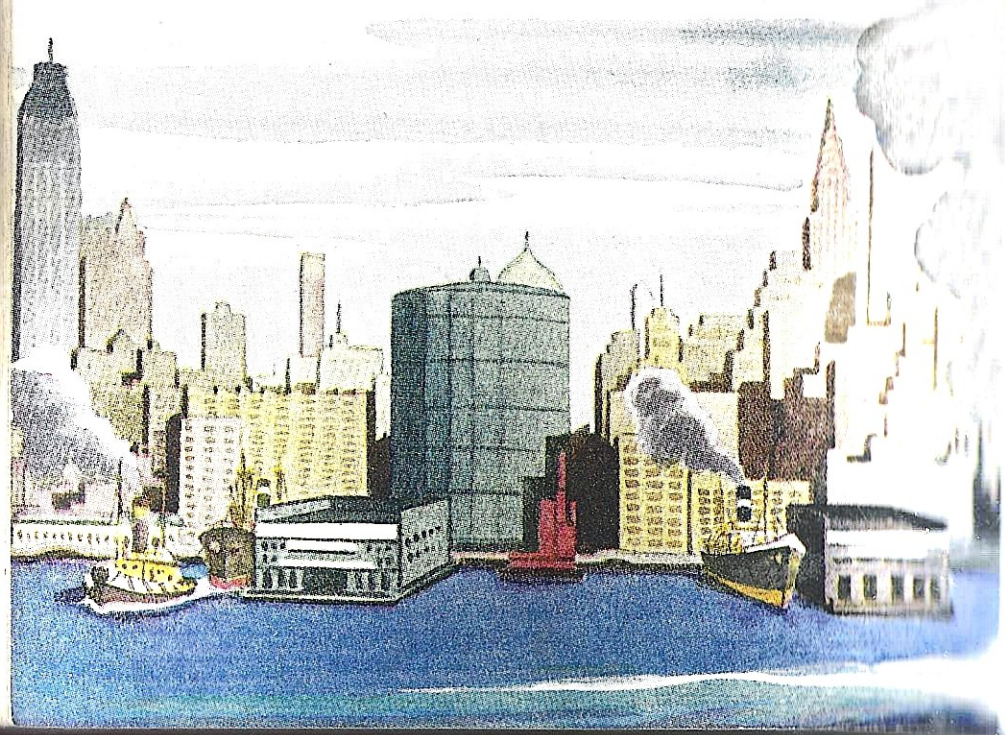
Improvement Tests. In ex. 4–9, write R before remainders.

1. Any story about New York City deals with very large numbers. New York has a population of 7,756,600 people, which makes it the largest city in the United States. Round this number off to the nearest million; to the nearest hundred thousand; to the nearest ten thousand.

2. Read these numbers showing the food eaten in a recent year in New York: 202,928,940 dozen eggs; 1,363,938,800 quarts of milk and cream; 1,618,321,205 pounds of meat; 244,299,056 pounds of butter.

3. In New York there are about 9,500,000 mi. of telephone wires. The distance around the earth at the Equator is 25,000 mi. How many times would the telephone wires of New York reach around the earth?

4. Recently on one day there were 12,287,627 telephone calls made in New York from 1,992,894 telephones. Round off these numbers to the nearest million and tell about how many calls this averaged per telephone.



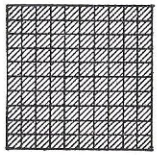
5. One baby is born in New York on an average of every 4 min. How many is that per day? per year?

6. New York produces about 82% of the furs, fur coats, and fur goods of the whole country. What per cent of such goods does the rest of the country produce?

7. The post offices of New York handle an average of 16,000,000 pieces of mail daily. How many pieces of mail is this per year?

8. In New York the number of fires in a recent year was 35,043. What was the average number of fires per day? What was the average number of fires per hour?

9. The Empire State Building in New York City is the tallest building in the world. Its height is 1250 ft. and there are 102 stories. Is the average height per story about 12.0 ft., 12.25 ft., or 12.4 ft.?



1. In the square at the left you see that there are 100 small squares and that they are all shaded. Each small square is 1% of the large square, so 100 small squares are 100% of the large square. You see that *all* of the large square, or 100% of it, is shaded. 100% of a square means *all* of it. You know that 100% = $\frac{100}{100}$, and that $\frac{100}{100} = 1$, so 100% also equals 1. The number 1 stands for all of one thing.

**100% = $\frac{100}{100}$ = 1 = one thing = all = the whole.**

2. 100% of $325 equals 1 × $325, or *all* of $325.
100% of the class means the *whole* class.
100% of the money collected means *all* the money.

3. Jim saw this sign on an apartment building: "100% rented." What did it mean?

4. Mrs. Wood bought two wool blankets. They are both marked "100% wool." What does this mean? Are they warm blankets?

5. A gallon can of maple sirup is marked "100% pure maple sirup." Can you tell the meaning of this?

6. Try to find the expression "100%" used in some way that is not already given above.

Change each statement below to percentage language:

7. All the boys in the Scout troop attended the meeting.
8. All the problems on John's test were correct.
9. The whole class went to the picnic.
10. They sold every one of the tickets for the game.
11. Our team has won all the games it has played.
12. The tag on the new sweater that Mary bought states that the sweater is all wool.
13. Every one of the tulip bulbs that Jack planted last fall came up this spring.



1. Our team has won 85% of the games it has played. What per cent of the games has it lost?

All of the games are 100% of them. If 85% of the games have been won, the rest, or 15% of the games, have been lost. You find 15% by subtracting 85% from 100%.

2. Mary saves 10% of her allowance. What per cent of her allowance does she spend?

3. Vermont produces about 40% of all the maple sugar used in the United States. What per cent of the maple sugar comes from all the other states?

4. In this country about 58% of all the persons from 5 yr. to 24 yr. of age are attending school. What per cent of the persons in this group are not attending school?

5. In Sally's class, 52% of the pupils are girls. What per cent of the pupils are boys?

6. Last fall 98% of the pupils in Lincoln School joined the Junior Red Cross. What per cent of the pupils did not join?

7. In a recent year the United States produced 30% of the world's cotton. What per cent of the cotton was produced by all the other countries?

8. Mr. King spends 20% of his salary for rent, 33% for food, and 39% for clothing and other things. If he saves the rest, what per cent of his salary does he save?

9. On an arithmetic test given in Jack's class 56% of the pupils got an excellent mark and 38% got a fair mark. The rest of the class did not pass the test. What per cent of the pupils did not pass the test?

10. Mr. Mason sold 60% of his strawberries at a roadside stand, sent 35% to the market, and gave Mrs. Mason the rest. What per cent of the strawberries did Mrs. Mason have for home use?

11. Joe's father gave him 50% of the price of a bicycle and Joe saved the rest. What per cent did Joe save?

## A SHORT WAY TO FIND 25%

1. During a bicycle sale bicycles were marked "$\frac{1}{4}$ off" in one store and "25% off" in another store. In each store the regular price of bicycles is $30. Which store offers the better price?

In the first store the price is reduced $\frac{1}{4}$. Dividing $30.00 by 4, you get $7.50, which is the amount of the reduction. During the sale this store sells bicycles at $30.00 − $7.50, or $22.50 each.

$$\begin{array}{r} \$\ 7.50 \\ 4\overline{)\$30.00} \end{array}$$

In the second store the price of a bicycle is reduced 25%. Multiplying $30 by .25, you also get $7.50. So the reduction is the same in both stores. Each store sells bicycles at $22.50.

$$\begin{array}{r} \$30 \\ .25 \\ \hline 150 \\ 60\phantom{0} \\ \hline \$7.50 \end{array}$$

You see that "25% off" is just the same as "$\frac{1}{4}$ off." $25\% = \frac{25}{100}$, which reduces to $\frac{1}{4}$. So $25\% = \frac{1}{4}$.

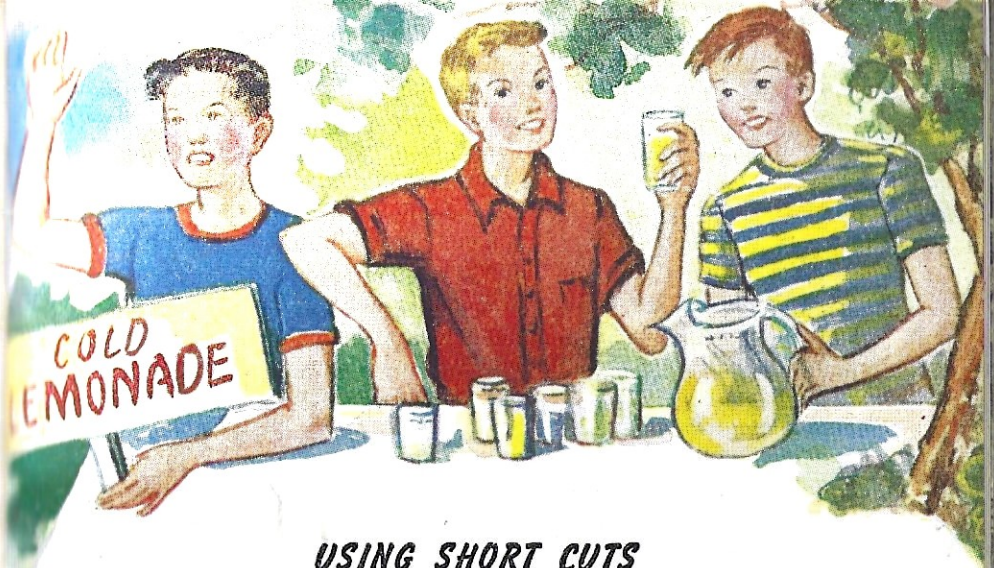
2. There are two other per cents which are used very often and which can easily be changed to fractions. $50\% = \frac{50}{100}$, which is $\frac{1}{2}$. So $50\% = \frac{1}{2}$. $75\% = \frac{75}{100}$, which can be reduced to $\frac{3}{4}$. So $75\% = \frac{3}{4}$.

3. Learn these short cuts:

25% of anything is the same as $\frac{1}{4}$ of it.
50% of anything is the same as $\frac{1}{2}$ of it.
75% of anything is the same as $\frac{3}{4}$ of it.

Use the short cuts above and find the answers mentally:

| | | |
|---|---|---|
| 4. 25% of 12 | 50% of $30 | 75% of $120 |
| 5. 50% of 10 | 75% of $36 | 75% of $400 |
| 6. 75% of 16 | 25% of $40 | 25% of $160 |
| 7. 25% of 20 | 50% of $50 | 75% of $800 |
| 8. 25% of 32 | 50% of $64 | 50% of $320 |
| 9. 50% of 22 | 75% of $40 | 25% of $240 |
| 10. 75% of 28 | 25% of $28 | 50% of $300 |
| 11. 50% of 16 | 75% of $20 | 25% of $100 |




## USING SHORT CUTS

1. Fred, George, and Jack sold lemonade and made $13.48 after expenses were paid. Fred furnished the glasses and made the lemonade so he got 50% of the money. George and Jack each got 25% of it. How much money did each boy get?

2. Mr. Green raised 1486 bu. of apples last year. This year he says that, due to cold weather during the spring, his apple crop will be only 50% of last year's crop. How many bushels of apples does Mr. Green expect this year?

3. There are 60 pupils in the sixth grade of Fulton School. If 75% of them enter the junior high school, how many pupils will go to junior high school from Fulton School?

4. Our school had a spring festival on the playground. We took in $120 all together. If 25% of the money was given to the school clubs, how much money did the clubs get?

Use short cuts to find the answers:

| | | |
|---|---|---|
| 5. 50% of $16.60 | 75% of $42.00 | 50% of $43.80 |
| 6. 25% of $50.00 | 50% of $13.50 | 75% of $35.68 |
| 7. 75% of $24.48 | 25% of $19.88 | 50% of $45.50 |
| 8. 75% of $15.20 | 25% of $21.64 | 50% of $12.26 |

1. Mrs. Brown wants to buy a new electric refrigerator. The price is $259.15 but Mr. Case will reduce the price 12% if she pays cash for it. How much can Mrs. Brown save by paying cash?

Find 12% of $259.15 as shown at the right. The answer is $31.0980; you can drop the 0 at the end of $31.0980, which gives $31.098. $31.098 is called $31.10 *to the nearest cent* because $31.098 is closer to $31.10 than it is to $31.09. Mrs. Brown will save $31.10 by paying cash. What will the refrigerator cost Mrs. Brown?

```
$259.15
    .12
 5 1830
25 915
$31.0980
```

If the answer had been $31.052, you would call it $31.05 *to the nearest cent.* Why? If the answer had been $31.055, which is halfway between $31.05 and $31.06, you would call it $31.06 *to the nearest cent.* See page 206.

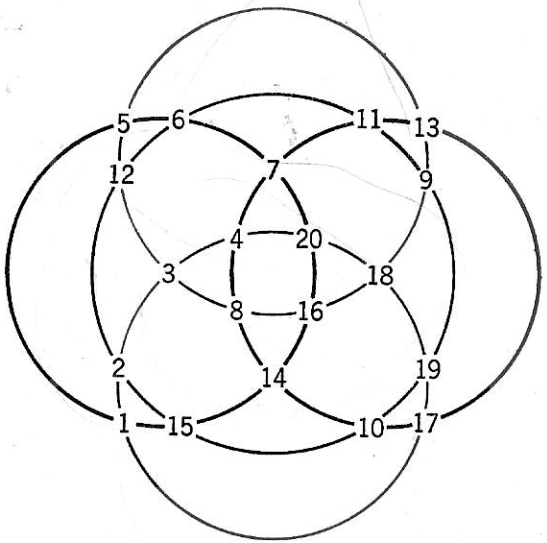
*To find an answer correct to the nearest cent, if the figure in the third decimal place is 5 or more, drop it but make the figure before it 1 larger; if the figure in the third decimal place is less than 5, drop it.*

Find these per cents. Round off the answers to the nearest cent:

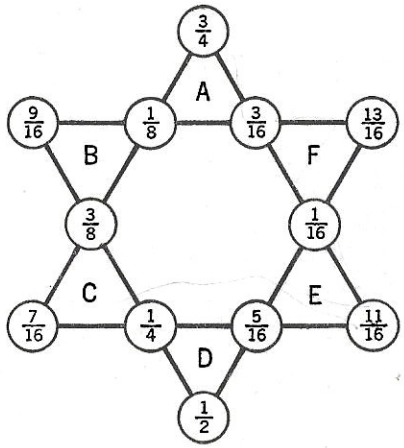
| | | |
|---|---|---|
| 2. 3% of $14.90 | 1% of $38.80 | 11% of $10.50 |
| 3. 4% of $25.65 | 9% of $16.70 | 10% of $24.82 |
| 4. 2% of $12.15 | 3% of $12.50 | 50% of $11.75 |
| 5. 5% of $19.34 | 6% of $30.15 | 75% of $32.70 |
| 6. 6% of $11.25 | 7% of $68.50 | 25% of $18.10 |
| 7. 1% of $22.20 | 8% of $36.35 | 15% of $17.32 |
| 8. 7% of $46.30 | 2% of $16.85 | 40% of $15.86 |
| 9. 9% of $11.20 | 5% of $27.22 | 24% of $36.45 |
| 10. 4% of $10.35 | 1% of $16.50 | 50% of $19.25 |
| 11. 8% of $12.65 | 3% of $30.40 | 25% of $33.54 |



1. Find the sum of the eight numbers on each of the five circles. If the sums are all alike, these are *magic circles.*




2. Add the four fractions on each straight line of the star below. Are the six sums all alike? Then add the three fractions at the corners of each of the two large triangles that form the star; that is, add $\frac{3}{4}$, $\frac{11}{16}$, and $\frac{7}{16}$; then add $\frac{9}{16}$, $\frac{13}{16}$, and $\frac{1}{2}$. Are the two sums alike? Next add the three fractions at the corners of the small triangle marked *A*. Then add the three fractions at the corners of each of the other triangles marked *B*, *C*, *D*, *E*, and *F*. Are all these six sums alike?



1. Peggy read that $\frac{3}{4}$ of a banana is made up of water. Read this statement using the language of percentage.

2. Jack read that 87% of an orange is water, 4% is other matter, and the rest is sugar. What per cent is sugar?

3. Watermelons are 92% water and 6% sugar. What per cent of a watermelon is made up of other matter?

4. For the school picnic we had 10 watermelons that weighed an average of 15 lb. each. How many pounds of water did we buy if 92% of a watermelon is water?

5. Mary says that she usually spends 50% of every 24 hr. in sleeping and eating, 25% in school and doing home work, and the rest of the time practicing, working, and playing. How many hours does Mary spend in each way?

6. As treasurer of the ball club Tom must pay a bill for $25.82. If he pays it promptly, the store will take 5% off the bill. How much can be saved if Tom pays the bill promptly? Find the answer to the nearest cent.

7. The Government tax on a railroad ticket is 15%. How much tax must you pay on a ticket that sells for $25.40?

8. In 1940 when the census was taken there were 131,669,000 people living in the United States and 23% of these people lived on farms. How many people lived on farms in 1940?

9. The census of 1940 shows that 23% of the population lived on farms, 20% lived in the country but not on farms, and the rest lived in cities. What per cent lived in cities?

10. Of the 50,000,000 telephones in the world about 52% are in the United States. About how many telephones are there in the United States?

11. Of the world's telephones, 52% are in the United States, 4% in other parts of North America, and 34% in Europe. What per cent of telephones are in the rest of the world?



Addition Test 6a. Time: 4 min.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1. | 24 | 14 | 26 | 39 | 37 | 31 | 59 |
| | 41 | 49 | 40 | 73 | 62 | 27 | 22 |
| | 77 | 20 | 54 | 68 | 93 | 99 | 77 |
| | 53 | 97 | 17 | 56 | 18 | 75 | 80 |
| | 68 | 85 | 66 | 42 | 38 | 41 | 46 |
| | 96 | 68 | 92 | 83 | 29 | 56 | 55 |
| | 35 | 73 | 24 | 39 | 10 | 85 | 63 |
| | 44 | 41 | 78 | 27 | 83 | 11 | 24 |
| | 52 | 52 | 33 | 21 | 52 | 64 | ⑦ 14 |

Addition Test 6b. Time: 4 min.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 2. | 49 | 18 | 97 | 94 | 89 | 19 | 67 |
| | 83 | 84 | 25 | 68 | 57 | 81 | 49 |
| | 67 | 61 | 76 | 11 | 16 | 48 | 22 |
| | 48 | 77 | 59 | 42 | 74 | 72 | 85 |
| | 96 | 96 | 83 | 76 | 65 | 67 | 55 |
| | 25 | 29 | 60 | 49 | 38 | 56 | 46 |
| | 34 | 15 | 55 | 30 | 23 | 35 | 74 |
| | 81 | 62 | 13 | 93 | 29 | 53 | 32 |
| | 15 | 22 | 29 | 42 | 42 | 24 | ⑦ 11 |

Addition Test 6c. Time: 4 min.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 3. | 37 | 25 | 25 | 59 | 95 | 74 | 38 |
| | 25 | 97 | 64 | 44 | 26 | 42 | 72 |
| | 41 | 58 | 29 | 63 | 42 | 96 | 66 |
| | 78 | 73 | 41 | 22 | 61 | 23 | 34 |
| | 93 | 85 | 98 | 96 | 15 | 87 | 49 |
| | 16 | 64 | 12 | 81 | 74 | 91 | 53 |
| | 34 | 39 | 56 | 32 | 37 | 35 | 81 |
| | 42 | 40 | 73 | 68 | 89 | 17 | 59 |
| | 27 | 42 | 17 | 29 | 53 | 14 | ⑦ 16 |

Improvement Tests.

To THE PUPIL: This is the last set of Improvement Tests you will have this year. Try to get a score of 10 on each test.

1. Miss Lane gives piano lessons for 6 hr. each school day. Each lesson is $\frac{3}{4}$ hr. long. How many piano lessons does she give each school day?

2. A road map is drawn on a scale of $\frac{1}{2}$ in. = 10 mi. If two towns are $2\frac{1}{2}$ in. apart on the map, what is the distance in miles between these towns?

3. At \$.025 a mile, what is the cost of a railroad ticket for a trip of 960 mi.?

4. Find the volume of a tin can that is 4 in. long, $2\frac{1}{2}$ in. wide, and $9\frac{1}{2}$ in. high.

5. In 3.5 hr. Joe and his father drove a total distance of 112.7 mi. What was their average speed in miles per hour?

6. Mary bought a bathing suit that had a regular price of \$6.50. The price was reduced 20%. How much did Mary pay for the bathing suit?

7. Last month the expenses for running Mr. Black's car were \$51.48. He drove the car 725 mi. in all. Find, to the nearest cent, the cost per mile of running the car.

8. On Saturday three girls rode their bicycles $1\frac{1}{4}$ mi. to the library, $2\frac{1}{2}$ mi. to Willow Farm, and $4\frac{3}{8}$ mi. to get home by way of High Falls. How many miles did they ride in all?

9. The road map shows that it is 16.8 mi. from Harrison to Newton by the new highway and 19.5 mi. by the old road. If Mr. Lee drives from Harrison to Newton by one road and back by the other, how far does he drive?

10. Mr. Wilson owns 3 farms. One contains 39 acres, another contains 52 acres, and the third contains 44 acres. What is the average number of acres per farm?

11. An airplane flew across the ocean in 7 hr. The total distance covered was 2200 mi. Find the speed of the airplane in miles per hour. Carry your answer to the nearest hundredth of a mile.



1. Jim works in Brown's Radio Store on Saturdays. For several months he has been saving his money to buy a radio that sells for \$25. Mr. Brown has told Jim that he can have a 20% *discount* because he works in the store. This means that Jim can buy the radio for 20% less than the regular price of \$25. Since 20% of \$25 is .20 × \$25, or \$5, Jim can get the radio for \$5 less than \$25, or \$20.

2. If Jim decides to buy a radio that sells for \$39.50 and can have a discount of 20%, how much will he save on that radio? How much will he pay for it?

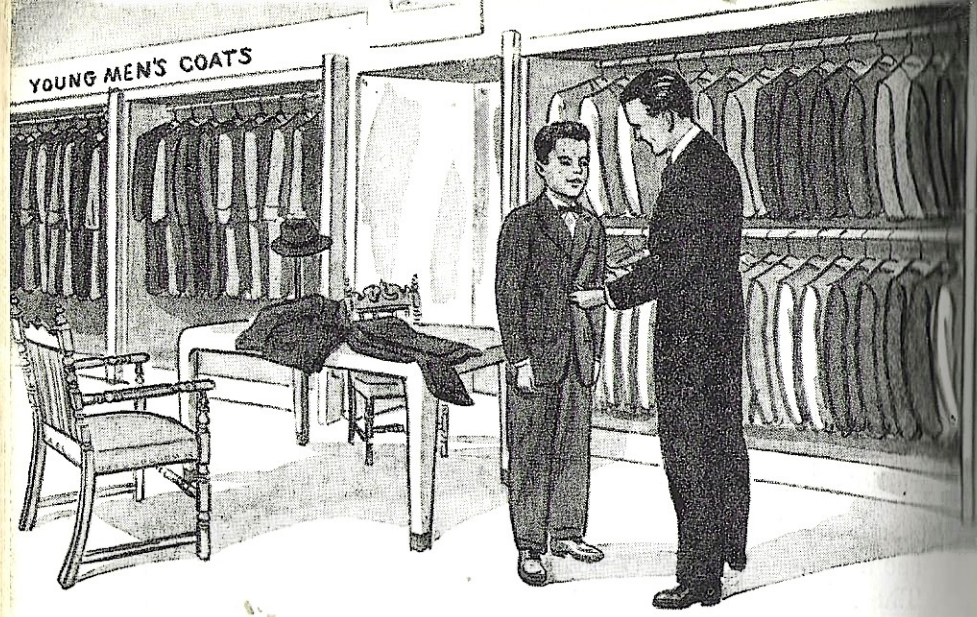
3. Sometimes in the newspaper or in a store window you see an advertisement of a sale where the prices are reduced. The amount of reduction is called the *discount*. If the discount is 25%, it may be stated as "25% off" or as "$\frac{1}{4}$ off." Find the discount if a radio selling at \$29.50 is reduced 10%. How much do you pay for the radio?

4. Look in several newspapers and find, if possible, some advertisements about things being sold at a discount. Try to find one where the discount is expressed as a per cent and another where it is expressed as a fraction. The word *discount* need not appear in the advertisements.

5. Alice waited until after Easter to buy a straw hat. Then she found one that had been \$3.50 and was selling at a discount of 20%. How much did she save by waiting? How much did she pay for the hat?

Find the discount and the amount you pay if you buy articles having these regular prices and discounts:

| | | | |
|---|---|---|---|
| 6. | \$12.50, 10% | \$12.75, 20% | \$50.00, 15% |
| 7. | \$10.00, 50% | \$14.40, 25% | \$11.60, 30% |
| 8. | \$15.60, 25% | \$16.30, 10% | \$16.00, 25% |
| 9. | \$18.75, 20% | \$15.35, 40% | \$18.62, 50% |
| 10. | \$12.80, 25% | \$17.90, 10% | \$43.25, 20% |




## BUYING AT A SALE

A month after Easter had passed Ward's store advertised a sale of spring coats, suits, hats, and dresses. Mrs. West waited to buy clothes for Jack and Jane so that she could save some money.

1. In the boys' department overcoats were selling at a discount of 25%. Jack saw one which sold regularly at $14.00 and another at $15.80. Find the discount on each coat. How much was the sale price of each coat?

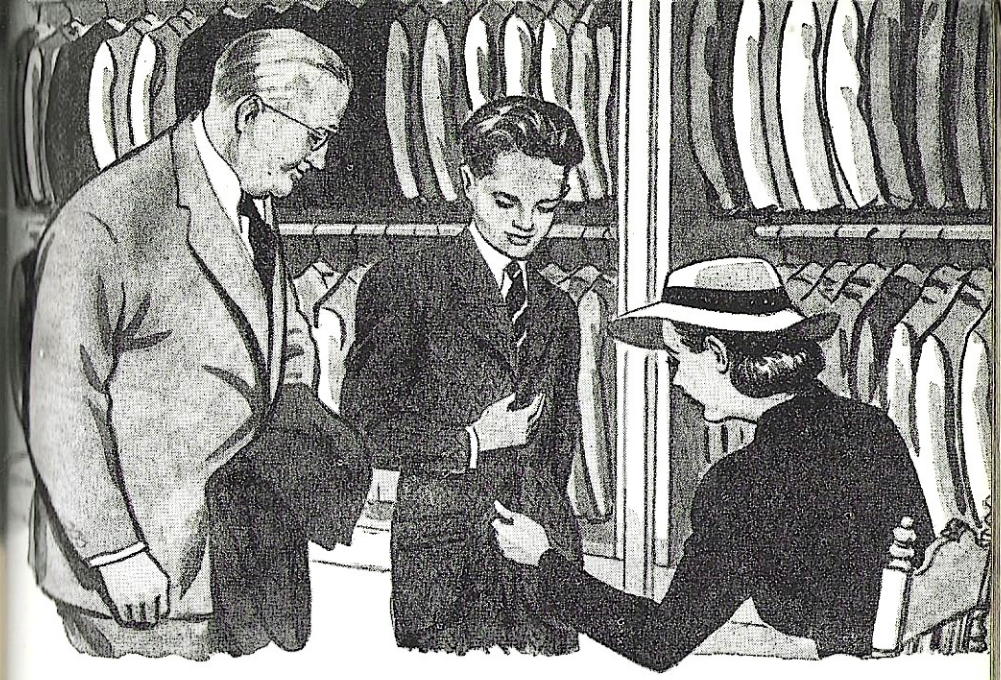
2. Jack needed a new suit too. The discount on suits was 20%. Find the discount on a suit regularly priced at $12.75; on one priced at $14.95. How much was the sale price of each suit?

3. Jack bought a hat that was marked down 10% from $1.90. How much did he pay for the hat?

4. Find the cost of Jack's things if his coat cost $11.85, his suit cost $10.20, and his hat cost $1.71.

5. Mrs. West paid for these things with a 20-dollar bill and a 10-dollar bill. How much change did she get?





6. In the girls' department Jane found two coats that she liked. They were both selling at a discount of 20%. If the coats were regularly priced at $10.95 and $9.75, find the discount on each coat and the sale price of each coat. Jane bought the cheaper coat.

7. Mrs. West bought two dresses for Jane. One was marked down 10% from $4.00 and the other was marked down 10% from $3.50. How much did the two dresses cost?

8. Jane wanted a straw hat and a tam. The straw hat was marked down 30% from $2.50 and the tam was marked down 10% from $1.50. How much was the discount on the two hats? Find the sale price of the two hats.

9. Find the cost of Jane's things if her coat cost $7.80, her dresses cost $6.75, and her hats cost $3.10.

10. How much did Mrs. West pay for Jack's things and Jane's things all together? See ex. 4 and 9. You see that it costs a lot of money to buy clothes for boys and girls. You should be careful of your clothes and take good care of them.

1. Take the test on the 100 addition facts on page 6.

Add and check the work:

| | | | | | | |
|---|---|---|---|---|---|---|
| 2. | 3793 | 6185 | 2328 | 2952 | 3179 | 1243 |
| | 4606 | 3667 | 4555 | 4644 | 2761 | 4436 |
| | 2273 | 4434 | 9384 | 2001 | 5353 | 6304 |
| | 9745 | 3785 | 7867 | 1694 | 8320 | 1453 |
| | 2058 | 9374 | 1000 | 8528 | 2119 | 3765 |
| | 5328 | 5204 | 2049 | 4524 | 7575 | 5524 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 3. | 6.9 | 22.6 | 9.13 | 172.5 | 56.33 | 2.125 |
| | .7 | 1.3 | 2.25 | 283.4 | 81.75 | 6.500 |
| | 7.0 | 10.8 | 6.50 | 100.5 | 22.46 | 3.750 |
| | 4.3 | 6.0 | 4.75 | 212.9 | 19.50 | 8.375 |
| | .8 | 2.4 | 8.37 | 57.8 | 17.38 | 4.625 |
| | 1.4 | 11.6 | 1.40 | 136.3 | 9.25 | 2.250 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 4. | .37 | .007 | 28.5 | 6.400 | 7.221 | 38.44 |
| | .05 | .012 | 5.6 | 2.250 | 4.107 | 21.57 |
| | .12 | .715 | 11.9 | 1.375 | 3.004 | 19.75 |
| | .95 | .125 | 16.8 | .875 | 9.256 | 11.33 |
| | .62 | .498 | 9.4 | 2.500 | 1.050 | 10.12 |
| | .56 | .009 | 8.1 | 4.125 | 6.522 | 25.50 |

Copy, add, and check:

5. 46 + 28 + 52 + 94 + 47 + 35 + 82 + 73 + 18
6. 38 + 17 + 24 + 53 + 85 + 12 + 44 + 19 + 68
7. 261 + 195 + 427 + 384 + 550 + 713 + 300 + 637
8. 186 + 250 + 409 + 336 + 107 + 500 + 218 + 620
9. .28 + .07 + .22 + .16 + .41 + .92 + .35
10. 1.25 + 2.38 + 15.12 + 9.75 + 2.67 + 10.16
11. 1.125 + 4.375 + .625 + 8.133 + 5.875
12. 2.5 + 9.25 + 4.125 + 3.4 + 6.75 + 1.2
13. \$112.60 + \$200.00 + \$350.75 + \$145.93 + \$420.50



1. After George had sold all the strawberries he picked he had 4 half dollars, 9 quarters, 11 dimes, 7 nickels, and 10 pennies. How much money did George have?

2. A car dealer received 28 new cars that cost him \$21,420. Find the average price of each car.

3. Betty is making a scale drawing. She is using $\frac{1}{4}$ in. to represent 5 ft. How long should she draw a line that represents 25 ft.?

4. A flier attempted to fly to a height of 45,000 ft. Just 60 ft. short of the goal he was forced to drop back. Give the height in feet to which the flier climbed.

5. How much more must you pay for 3 phonograph records at \$1.25 each than for 3 records at \$.85 each?

6. Virginia can knit $\frac{1}{4}$ in. of a scarf in 6 min. How many inches can she knit in $\frac{1}{2}$ hr.? in 1 hr.?

7. These were the amounts of Mr. Cole's sales in his store for 5 days: \$382.72, \$229.08, \$316.43, \$350.13, \$294.59. Find the average amount of his sales per day.

8. Peter feeds his dog 1 lb. 4 oz. of dog food per day. How many days will a 25-pound bag of dog food last?

9. Joe read that an airplane company plans to cut the time for a trip from New York to Brazil from 66 hr. to 19 hr. 50 min. How much time will be saved on this trip?

10. Joe also read that the company planned to reduce the cost per mile for this trip from $8\frac{3}{4}$¢ to $3\frac{1}{2}$¢. This would be a saving of how many cents per mile?

11. At the reduced price what would be the saving on an airplane trip of 4800 mi.? See ex. 10.

12. Mrs. Jones received a bill for $6\frac{1}{2}$ lb. meat at \$.45 a pound, 2 doz. eggs at \$.39 a dozen, 4 bars soap at \$.08 each, and $\frac{3}{4}$ lb. cheese at \$.36 a pound. Write the bill, supplying necessary names and dates. Receipt it.

1. Take the test on the 100 subtraction facts on page 9.

Subtract. Check the work by adding:

| | | | | | |
|---|---|---|---|---|---|
| 2. | 4052 | 1.275 | 28.16 | 6631.5 | $3662.75 |
| | 1946 | .833 | 18.29 | 4073.7 | 1243.90 |
| 3. | 5186 | 6.250 | 76.95 | 4183.8 | $6000.00 |
| | 1248 | 4.625 | 53.89 | 2654.8 | 5580.17 |
| 4. | 9000 | 2.125 | 70.49 | 2994.5 | $7898.19 |
| | 3473 | 1.500 | 36.48 | 1747.6 | 7732.76 |
| 5. | 1212 | 5.750 | 74.32 | 8373.3 | $7586.25 |
| | 875 | 3.875 | 58.43 | 3675.9 | 2106.48 |
| 6. | 3000 | 7.000 | 44.49 | 9421.8 | $1279.53 |
| | 1164 | 2.375 | 6.41 | 1569.2 | 414.93 |

7. Take the test on page 6, using it as a test on the 100 multiplication facts.

Multiply and check the work:

| | | | | | | |
|---|---|---|---|---|---|---|
| 8. | 6289 | 275 | 1.25 | 103 | .12 | 7.36 |
| | 352 | .07 | 9 | .006 | .4 | 23.7 |
| 9. | 2057 | 633 | 32.6 | 50.9 | .15 | 65.4 |
| | 419 | .09 | .04 | 1.65 | .8 | 13.8 |
| 10. | 3465 | 200 | 125 | 738 | 1.6 | .243 |
| | 768 | .12 | .07 | .002 | .03 | 146 |
| 11. | 4316 | 539 | 2.06 | 216 | 2.9 | 6.75 |
| | 132 | 4.3 | .9 | .091 | .02 | 39.4 |
| 12. | 1738 | 628 | 83.4 | 473 | 8.7 | 58.4 |
| | 506 | .006 | .18 | .001 | .08 | 2.57 |



1. You know how much money you had in your pocket when you went to the store. You know how much you have left. How do you find how much money you spent?

2. You know how many eggs the hens laid this week. You want to put the eggs in boxes containing one dozen each. How do you find how many boxes you will need?

3. You know how much you paid for a football at the sale. You know the regular price of the football before the sale. How do you find how much you saved by buying at the sale?

4. You know how much money you have to spend for bus tickets. You know the cost of one ticket. How do you find how many tickets you can buy?

5. You know how many times you went to the movies last month. You know how much money you spent all together for movie tickets. How do you find the average price you paid per ticket?

6. You know the amount of your allowance each week and the amount of money you earn delivering papers each week. How do you find the total amount you get each week?

7. You know how much George paid for his bicycle. You know how much you paid for your bicycle. How do you find the difference between the prices of the bicycles?

8. You know how many miles a car averages on one gallon of gasoline. You know how many gallons of gasoline there are in the tank. How do you find how many miles the car can travel on that amount of gasoline?

9. You know how much you paid for the cloth for your dress. You know how many yards of cloth you bought. How do you find the price of the cloth per yard?

10. You know the number of miles your father drove his car on a trip and the number of hours he drove. How do you find the average number of miles per hour he drove?

Add. Check by going over the work:

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1. | $\frac{3}{8}$ | $4\frac{2}{3}$ | $2\frac{1}{2}$ | $9\frac{3}{16}$ | $2\frac{1}{4}$ | $5\frac{1}{6}$ | $7\frac{9}{10}$ |
| | $\frac{5}{8}$ | $7\frac{5}{6}$ | $1\frac{3}{4}$ | $5\frac{7}{8}$ | $2\frac{1}{3}$ | $3\frac{3}{4}$ | $4\frac{3}{8}$ |
| 2. | $\frac{7}{12}$ | $4\frac{3}{8}$ | $1\frac{5}{6}$ | $1\frac{9}{10}$ | $4\frac{1}{12}$ | $1\frac{1}{4}$ | $3\frac{5}{12}$ |
| | $\frac{1}{12}$ | $1\frac{1}{2}$ | $4\frac{5}{6}$ | $2\frac{1}{2}$ | $4\frac{5}{6}$ | $2\frac{1}{2}$ | $2\frac{3}{8}$ |
| | $\frac{1}{12}$ | $6\frac{3}{4}$ | $5\frac{5}{6}$ | $2\frac{2}{5}$ | $3\frac{2}{3}$ | $1\frac{1}{3}$ | $8\frac{2}{3}$ |

Subtract. Check by going over the work:

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 3. | $\frac{5}{6}$ | $3\frac{3}{4}$ | $7\frac{1}{2}$ | $4\frac{2}{3}$ | 9 | $2\frac{1}{2}$ | $7\frac{1}{8}$ |
| | $\frac{1}{2}$ | $1\frac{1}{2}$ | $4\frac{5}{6}$ | $1\frac{3}{4}$ | $2\frac{5}{8}$ | $1\frac{3}{4}$ | $3\frac{5}{10}$ |
| 4. | $\frac{7}{10}$ | $8\frac{1}{8}$ | $5\frac{3}{4}$ | $8\frac{9}{16}$ | $6\frac{1}{4}$ | $2\frac{1}{5}$ | $9\frac{9}{10}$ |
| | $\frac{3}{10}$ | $7\frac{5}{8}$ | $2\frac{3}{4}$ | $4\frac{3}{8}$ | $4\frac{5}{6}$ | $1\frac{1}{2}$ | $5\frac{1}{2}$ |

Find the answers. Watch the signs:

| | | | | |
|---|---|---|---|---|
| 5. | $\frac{3}{4} + \frac{7}{8}$ | $\frac{1}{2} \times \frac{5}{8}$ | $11\frac{2}{3} \div 8\frac{1}{6}$ | $2\frac{1}{2} \div 1\frac{1}{4}$ |
| 6. | $\frac{3}{4} \div \frac{3}{10}$ | $\frac{11}{12} - \frac{1}{6}$ | $12\frac{1}{2} \times 1\frac{1}{5}$ | $1\frac{1}{2} \times 4\frac{2}{3}$ |
| 7. | $\frac{3}{4} \times \frac{1}{2}$ | $\frac{9}{10} \times \frac{1}{3}$ | $11\frac{2}{3} \div 21$ | $1\frac{2}{3} \times 1\frac{4}{5}$ |
| 8. | $\frac{5}{6} \times \frac{9}{10}$ | $4 \times \frac{5}{6}$ | $10\frac{5}{8} \times 16$ | $1\frac{1}{5} \div 12$ |
| 9. | $\frac{3}{8} \div 3$ | $8 \div \frac{2}{3}$ | $18\frac{3}{4} \div 3\frac{3}{4}$ | $2\frac{1}{2} \div 15$ |
| 10. | $6 - \frac{7}{10}$ | $\frac{1}{4} \div \frac{3}{16}$ | $13\frac{1}{3} \times 18$ | $7\frac{3}{5} + 2\frac{2}{3}$ |
| 11. | $5 \div \frac{2}{5}$ | $\frac{3}{4} \div \frac{5}{6}$ | $11\frac{1}{2} - 5\frac{2}{3}$ | $2\frac{1}{2} \times 2\frac{1}{2}$ |
| 12. | $\frac{2}{3} \times \frac{5}{8}$ | $\frac{3}{4} \times 6$ | $16\frac{1}{3} \div 1\frac{1}{6}$ | $3\frac{1}{3} \times 1\frac{7}{8}$ |
| 13. | $\frac{7}{8} - \frac{3}{8}$ | $\frac{7}{16} \div \frac{7}{8}$ | $100 \times 2\frac{1}{2}$ | $2\frac{5}{8} \div 14$ |
| 14. | $\frac{5}{6} - \frac{1}{2}$ | $\frac{3}{10} \times \frac{5}{8}$ | $10\frac{1}{2} \div 8\frac{3}{4}$ | $1\frac{1}{2} \times 1\frac{1}{3}$ |
| 15. | $9 + \frac{3}{8}$ | $\frac{9}{16} \times \frac{2}{3}$ | $12\frac{1}{4} \div 3\frac{1}{2}$ | $1\frac{1}{8} \div 12$ |
| 16. | $\frac{4}{5} - \frac{1}{2}$ | $\frac{15}{16} \div \frac{5}{8}$ | $14\frac{2}{3} \times 3\frac{3}{4}$ | $3\frac{3}{8} + 4\frac{1}{2}$ |
| 17. | $\frac{7}{8} \div 2$ | $\frac{9}{10} \times \frac{2}{3}$ | $11\frac{1}{4} \div 15$ | $17 - 8\frac{3}{8}$ |



Read the statements below and tell the correct word to put in each space. Do not write in the spaces:

1. A number that is exactly divisible by 2 is called an ------ -------.

2. A number that is not exactly divisible by 2 is called an ------ -------.

3. When you say that 2,928,600 is about 3,000,000, you call 3,000,000 a ------ -------.

4. When you write $\frac{10}{15}$ as $\frac{2}{3}$ the fraction has been ------ ------ ------ -------.

5. When you find the distance around a rectangular field you are finding the ------ of the field.

6. When you find how many acres the field contains you are finding its -------.

7. When you say that a field is 20 rd. by 35 rd., you are giving its -------.

8. .9 is a ------ fraction, but $\frac{9}{10}$ is a ------ fraction.

9. When one apple is divided into 4 equal parts, each part is called a -------.

10. The second place to the right of the decimal point is called ------ place.

11. When the answer \$12.075 is written as \$12.08 the answer is given to the ------ -------.

12. Another way to write $\frac{1}{2}$ of a number is to write 50 ------ ------ of the number.

13. When you add 4 numbers together and divide the sum by 4 you are finding the ------ of the numbers.

14. When you divide the distance traveled by the number of hours required, the answer is the ------ per hour.

15. In the language of percentage, 100% of the class means the ------ class.

1. Mr. Davis packed and sold 6975 boxes of oranges. There were 1950 boxes that held 150 oranges each, 2400 boxes that held 176 oranges each, and the rest held 220 each. How many oranges did he sell?

2. How many dozen oranges all together did Mr. Davis sell? See ex. 1.

3. One year the first day of April came on Saturday. How many Saturdays were there in April that year and what were their dates?

4. How many Sundays were there in April that year? how many Mondays? See ex. 3.

5. Draw a bar graph to represent the heights of these big dams in the United States: Boulder, 726 ft.; Shasta, 602 ft.; Grand Coulee, 550 ft.

6. When Jack bought a bus ticket to camp last spring it cost $8.60. Now the price is 15% more. How much has the price been increased? What is the price of the ticket now?

7. Mr. King has three lots for sale, all rectangular in shape. One is 90 ft. by 120 ft., another is 85 ft. by 125 ft., and the third is 100 ft. by 110 ft. Which lot has the largest area and how much larger is it than either of the others?

8. Mrs. Case drove her car 500 mi. and used 32 gal. of gasoline. Find, to the nearest tenth of a mile, the average number of miles Mrs. Case drove per gallon of gasoline.

9. Mrs. Case paid $.22 per gallon for 10 gal. of gasoline, $.196 per gallon for another 10 gal., and $.215 per gallon for the rest of the 32 gal. Find the total amount Mrs. Case paid for all the gasoline for her trip of 500 mi.

10. On a scale drawing $\frac{1}{8}$ in. represents 1 ft. If a line $2\frac{3}{4}$ in. long represents the length of a room, how long is the actual room? If a line $1\frac{7}{8}$ in. long represents the width, how many feet wide is the actual room?



Tell the number to put in place of each star:

1. $1\frac{1}{3} = \frac{*}{3}$ $\quad \frac{5}{6} = \frac{*}{12}$ $\quad 4\frac{1}{2} = 3\frac{*}{2}$ $\quad 7\frac{1}{3} = 7\frac{*}{6} = 6\frac{*}{6}$
2. $6\frac{1}{4} = \frac{*}{4}$ $\quad \frac{3}{4} = \frac{*}{16}$ $\quad 2\frac{7}{8} = 1\frac{*}{8}$ $\quad 5\frac{3}{4} = 5\frac{*}{12} = 4\frac{*}{12}$
3. $3\frac{5}{8} = \frac{*}{8}$ $\quad \frac{3}{3} = \frac{*}{12}$ $\quad 6\frac{5}{6} = 5\frac{*}{6}$ $\quad 4\frac{3}{5} = 4\frac{*}{10} = 3\frac{*}{10}$

Change to fractions:

4. .21 .30 .03 .50 .75 .375

Tell the number to put in each space. First see what fraction you add to the first fraction to get the second one:

5. $\frac{3}{8}, \frac{5}{8}, \frac{7}{8}, \ldots, \ldots$ $\quad \frac{1}{2}, \frac{3}{4}, 1, \ldots, \ldots$
6. $\frac{1}{16}, \frac{3}{16}, \frac{5}{16}, \ldots, \ldots$ $\quad \frac{3}{8}, \frac{3}{4}, 1\frac{1}{8}, \ldots, \ldots$

7. Multiply each number by 10; by 100; by 1000: 2500 250 25 2.5 .25 .025

8. Does 4.7 × 12.5 equal 587.5, 58.75, or 5.875?

9. Does 25 × .06 equal 150, 1.50, or .150?

10. Does .09 × 82.6 equal 743.4, 74.34, or 7.434?

11. Does 2.2 × 19.3 equal 424.6, 42.46, or 4.246?

12. Find 50% of 24; of 30; of 100.

13. Find 25% of 32; of 48; of 160.

Tell the number to put in each space:

14. 12 oz. = ... lb. $\quad$ 500 lb. = ... cwt.
15. 24 mo. = ... yr. $\quad$ 500 lb. = ... ton
16. 14 pk. = ... bu. $\quad$ 6 sq. ft. = ... sq. yd.
17. 11 ft. = ... yd. $\quad$ 528 ft. = ... mi.
18. 10 ft. = ... in. $\quad$ 25 qt. = ... gal. ... qt.
19. 36 hr. = ... da. $\quad$ 35 oz. = ... lb. ... oz.
20. 24 qt. = ... pk. $\quad$ 100 min. = ... hr. ... min.

Tell where the decimal point belongs in each product:

| | | |
|---|---|---|
| 1. | $15 \times 2.75 = 4125$ | $.046 \times 271 = 12466$ |
| 2. | $36 \times .127 = 4572$ | $1.29 \times 41.3 = 53277$ |
| 3. | $29 \times .085 = 2465$ | $7.25 \times 11.7 = 84825$ |
| 4. | $12 \times 78.2 = 9384$ | $.143 \times 628 = 89804$ |
| 5. | $.09 \times 99.2 = 8928$ | $.094 \times 173 = 16262$ |
| 6. | $.79 \times 43.4 = 34286$ | $21.7 \times 50.2 = 108934$ |
| 7. | $6.3 \times 5.53 = 34839$ | $63.4 \times 9.26 = 587084$ |
| 8. | $2.6 \times 4.07 = 10582$ | $18.9 \times 93.8 = 177282$ |
| 9. | $5.4 \times 98.7 = 53298$ | $3.75 \times 87.3 = 327375$ |

Put the decimal point in the right position in each quotient, inserting zeros if necessary:

| | | | | |
|---|---|---|---|---|
| 10. | 47 / .5)2.35 | 7 6 / .02)15.2 | 38 / .09)342 | 56 / .114)6.384 |
| 11. | 15 9 / .2)31.8 | 16 / .12)1.92 | 1 1 / 1.4)15.4 | 27 / 2.38)6.426 |
| 12. | 86 / .4).344 | 125 / .05).625 | 7 / 2.5).175 | 32 / 19.4)6.208 |
| 13. | 8 / .9).072 | 1 76 / .03)5.28 | 3 / .16).048 | 48 / .062)29.76 |
| 14. | 12 / .7).084 | 115 / .08).920 | 128 / .04)512 | 17 / 1.25)2125 |
| 15. | 3 7 / .6)22.2 | 8 3 / .11)91.3 | 16 / 4.3)6.88 | 8 39 / .007)58.73 |
| 16. | 139 / .3)417 | 8 / .07).056 | 47 / .05).235 | 40 6 / .009)365.4 |
| 17. | 8 / .4).032 | 8 2 / .06)49.2 | 27 / 3.1)8.37 | 5 6 / .127)711.2 |



Tell which numbers are not needed to answer the question in the problem. Then work the problem:

1. At 6:30 A.M. Mr. Woodman left home in his truck with 120 doz. eggs to sell in the city. He arrived in the city at 7:45 A.M., after driving 35 mi. What was his average speed in miles per hour?

2. From a piece of cloth containing $21\frac{1}{4}$ yd. a clerk cut off $4\frac{1}{2}$ yd. for Mrs. Smith. At \$1.25 a yard, how much did Mrs. Smith pay for the cloth she bought?

3. Mary and her mother made sandwiches for Jack's birthday party. They had 4 loaves of bread, $\frac{3}{4}$ lb. of butter, 2 jars of jam, and 2 jars of peanut butter. They made 96 sandwiches and all but 8 were eaten. How many sandwiches were eaten?

4. Last week Betty received these amounts of money: \$.50 for her allowance, \$.40 for helping Mrs. King 2 hr., \$.65 for selling 2 used books, and \$.75 for doing 3 errands. How much money did Betty receive last week?

5. At a filling station regular gasoline costs \$.195 a gallon and special gasoline costs \$.225 a gallon. How much does Mr. Reed pay for 12 gal. of regular gasoline?

6. Mr. Case is 6 ft. 2 in. tall and weighs 170 lb. John Case is 4 ft. 10 in. tall and weighs 87 lb. How much taller is Mr. Case than John?

7. Ann saw an aquarium measuring 6 in. $\times$ 8 in. $\times$ 11 in. and another measuring 6 in. $\times$ 7 in. $\times$ 11 in. If she bought the second aquarium, how many gallons of water are needed to fill it to the top? 231 cu. in. = 1 gal.

8. In the city where Peggy lives it costs $2\frac{1}{2}$¢ an hour for electricity to run a vacuum cleaner and $3\frac{1}{4}$¢ an hour for electricity to run a toaster. If Peggy's mother uses her vacuum cleaner on an average of 10 hr. a month, what does the electricity for the cleaner cost?

1. Copy the four examples below with their answers:

| | | | |
|---|---|---|---|
| \$4.56 | \$1.35 | \$1.66 | 45 |
| − 1.27 | × 3 | 5)\$8.30 | + 63 |
| \$3.29 | \$4.05 | | 108 |

Then write after each number the word that tells what the number is called. In the first example, write *minuend* after \$4.56. What word will you write after \$1.27? after \$3.29? Do the same for each number in the other examples.

2. From the sum of $2\frac{5}{8}$ and $1\frac{3}{4}$ subtract $2\frac{7}{8}$.
3. From the product of 6 and $3\frac{2}{3}$ subtract $10\frac{1}{2}$.
4. Add to 5.3 the difference between 19.6 and 11.9.
5. Multiply 8.5 by .7 and divide the product by .05.
6. Change 40% to a fraction in its lowest terms.
7. Find the average of 13,622; 18,428; 15,905; and 20,077.
8. Find the average of $3\frac{1}{2}$, $2\frac{3}{4}$, 4, $5\frac{3}{8}$, $5\frac{5}{8}$, and $4\frac{3}{4}$.
9. Find the average of 11.25, 14.68, 10.92, and 6.75.
10. How much less than \$280 is \$225.33?
11. Which of these is larger, .25 or $\frac{1}{3}$? .8 or $\frac{3}{4}$?
12. Round off 2928 to the nearest thousand.
13. Round off 29.28 to the nearest tenth.
14. Round off 292.8 to the nearest whole number.

Divide. Check the work by multiplying:

| | | |
|---|---|---|
| 15. \$366.24 ÷ 42 | 518,468 ÷ 74 | 152,316 ÷ 483 |
| 16. \$231.24 ÷ 94 | 707,965 ÷ 85 | 133,590 ÷ 219 |
| 17. \$423.00 ÷ 45 | 283,416 ÷ 47 | 710,710 ÷ 910 |
| 18. \$205.92 ÷ 99 | 319,110 ÷ 66 | 299,185 ÷ 872 |
| 19. \$271.56 ÷ 62 | 256,639 ÷ 41 | 242,874 ÷ 309 |
| 20. \$368.60 ÷ 97 | 530,540 ÷ 82 | 365,292 ÷ 278 |



1. As treasurer of the class Jack received these amounts of money in May: \$1.15, \$.48, \$2.25, \$1.84, \$4.00, \$.60, \$5.25, \$.70, \$1.50. He paid bills for these amounts: \$2.65, \$8.32, \$.72, \$5.66. Balance the account and tell how much *cash on hand* he should have at the end of May.

2. Tom bought a package of 75 stamps for 25¢. At this price, how many stamps did he get for a nickel? for a penny?

3. Tom found that he already had 18 of these stamps in his book so he sold the 18 stamps to Bill at the same price for which he bought them. How much did Tom charge Bill for the stamps?

4. Draw a line graph to represent these changes in temperature from 9 A.M. to 5 P.M.:

| Hours | 9 | 10 | 11 | 12 | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|---|---|---|
| Degrees | 70 | 73 | 78 | 80 | 84 | 83 | 83 | 81 | 80 |

5. On her birthday Sally took 3 friends to the movies and afterwards bought them ice cream. Each movie ticket cost \$.35 and each dish of ice cream cost \$.10. How much did Sally spend for her friends and herself?

6. Mrs. Dean made a gallon of ice cream at a total cost of \$1.48 for the materials. She served the ice cream to 28 persons. What was the average cost of the ice cream per dish? Find the answer to the nearest cent.

7. Jim and Dick bought 25 lb. of peanuts for \$5.75 and small paper bags for \$.15. They put 4 oz. of peanuts in each bag and sold the bags at 10¢ each. How much money did each boy make if they shared the money equally?

8. Nancy can ride her bicycle $\frac{1}{4}$ mi. in 2 min. How many minutes does it take her to ride 1 mi.? How many miles can Nancy ride in an hour?

1. Take the test on the 90 division facts on page 16.

Divide. Check the work by multiplying. In ex. 2–5, write R before any remainder. In ex. 6–8, write the remainder as a fraction in the quotient:

| | | | | |
|---|---|---|---|---|
| 2. | 32)30592 | 46)92230 | 418)90706 | 325)652275 |
| 3. | 25)54339 | 38)17337 | 125)98250 | 462)108260 |
| 4. | 86)32605 | 21)19887 | 295)80431 | 332)205597 |
| 5. | 19)12122 | 60)45551 | 191)45076 | 284)129999 |
| 6. | 75)62190 | 34)70040 | 178)78320 | 591)249402 |
| 7. | 15)85920 | 93)65999 | 309)88477 | 286)294580 |
| 8. | 38)78280 | 67)56169 | 172)69660 | 116)131979 |

Divide, writing enough 0's after the decimal point to make the division come out exact. Check the work:

| | | | | | |
|---|---|---|---|---|---|
| 9. | 8)57 | 32)20 | 18)351 | 25)183 | 44)363 |
| 10. | 6)93 | 25)15 | 45)531 | 70)903 | 25)485 |
| 11. | 4)51 | 56)21 | 64)800 | 75)486 | 72)207 |

Divide. Carry the quotient to three decimal places; then round off the result correct to the nearest hundredth:

| | | | | | |
|---|---|---|---|---|---|
| 12. | 3)47 | 11)10 | 36)186 | 61)476 | 74)100 |
| 13. | 6)97 | 17)13 | 43)207 | 12)115 | 86)250 |
| 14. | 9)84 | 23)19 | 19)129 | 57)413 | 91)312 |



Say the answers:

| | | | | |
|---|---|---|---|---|
| 1. | $63 + 9$ | $5 \times 7 + 4$ | $37 \div 9$ | $2 + 6 + 9$ |
| 2. | $42 - 3$ | $9 \times 8 + 6$ | $28 \div 5$ | $7 + 8 + 6$ |
| 3. | $75 + 8$ | $8 \times 6 + 7$ | $10 \div 3$ | $9 + 9 + 4$ |
| 4. | $24 - 5$ | $7 \times 7 + 6$ | $15 \div 2$ | $6 + 8 + 5$ |

5. Count by 7's from 58 to 114; from 120 to 183.
6. Count by 8's from 34 to 106; from 125 to 181.
7. Count by 9's from 40 to 112; from 132 to 195.
8. How many figures are there in the number six billion?
9. Round off 2,846,219,788 to the nearest billion.
10. Read these numbers: MCMXI, DCCCCLXV, CCII.
11. Reduce to lowest terms: $\frac{12}{18}$, $\frac{12}{28}$, $\frac{15}{30}$, $\frac{24}{40}$, $\frac{12}{48}$.
12. Change to mixed numbers: $\frac{15}{4}$, $\frac{19}{5}$, $\frac{17}{2}$, $\frac{11}{3}$, $\frac{15}{6}$.
13. Change to fractions: $6\frac{1}{3}$, $12\frac{1}{2}$, $9\frac{1}{4}$, $3\frac{3}{5}$, $1\frac{5}{8}$.
14. Change to decimals: $\frac{9}{10}$, $\frac{11}{100}$, $\frac{337}{1000}$, $\frac{3}{100}$.
15. Change to fractions: .3, .51, .09, .033, .007.
16. Change to fractions: 25%, 75%, 50%.
17. Find 1% of \$600; of \$450; of \$12.
18. Find the sum of 3 lb. 4 oz. and 2 lb. 9 oz.
19. At 3 marbles for 5¢, find the cost of 18 marbles.
20. At 12 apples for 39¢, find the cost of 4 apples.
21. What part of a bushel is 2 pk.?
22. At the rate of 40 mi. an hour, how far can Mr. Wood drive in 2 hr.? in 3 hr.? in 30 min.? in 45 min.?
23. At the rate of 3 mi. an hour, how long will it take Joe to walk 9 mi.? 6 mi.? 4 mi.? 8 mi.?
24. Find the average of 8, 6, 3, 9, 4.

1. Show 3 ways to write 23 per cent.

2. Write as decimals: 17%, 43%, 3%, $\frac{11}{100}$, $\frac{33}{100}$, $\frac{7}{100}$, 21 per cent, 5 per cent.

3. Write with the sign %: .19, .40, .02, $\frac{16}{100}$, $\frac{75}{100}$, $\frac{3}{100}$.

Find these per cents:

| | | |
|---|---|---|
| 4. 30% of 80 | 5% of $240 | 15% of $1785 |
| 5. 12% of 75 | 4% of $125 | 75% of $2834 |
| 6. 10% of 40 | 2% of $350 | 40% of $1515 |

Find these per cents. Round off the answers to the nearest cent:

| | | |
|---|---|---|
| 7. 15% of $35.50 | 1% of $11.80 | 20% of $25.63 |
| 8. 32% of $27.30 | 6% of $15.35 | 24% of $36.70 |
| 9. 26% of $12.20 | 3% of $17.80 | 18% of $50.25 |

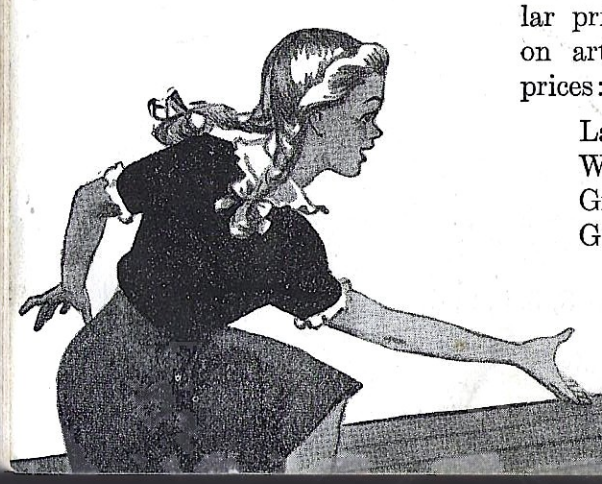
10. Tell the meaning of this statement: John's sweater is 100% wool.

11. State this sentence in the language of percentage: Every pupil in the school saw the movie called *Good Health*.

12. In Glendale 85% of the families own their homes. What per cent of the families do not own their homes?

13. At a sale the discount on all articles was 20% of the regular price. Find the discounts on articles with these regular prices:

| | |
|---|---|
| Lawn mower | $9.25 |
| Wheel barrow | $5.50 |
| Grass seed | $1.75 |
| Garden rake | $ .75 |





1. Today the Scout troop made a hike of 15 mi. in $4\frac{1}{2}$ hr. Find their average speed in miles per hour.

2. Last week the Scouts climbed a mountain. The distance was only $3\frac{3}{4}$ mi. but it took them $1\frac{1}{2}$ hr. Find their average speed climbing the mountain.

3. Jack had 2 hr. to wait for the train. He spent 45 min. of the time playing ball and the rest of it reading a book. What part of the 2 hr. did he spend in each way?

4. Mary can buy a radio with 5 tubes for $19.95 or one with 6 tubes for $23.65. What is the difference between the prices of these sets?

5. Helen bought a 20-dollar coat at a discount of 10% from the regular price. For how much less than the regular price did Helen buy the coat?

6. Mr. Bates is making an automobile trip today. These are the distances between the towns he will visit: 15.2 mi., 24.5 mi., 51.0 mi., 13.4 mi., 28.3 mi., and 30.8 mi. How many miles is the whole trip?

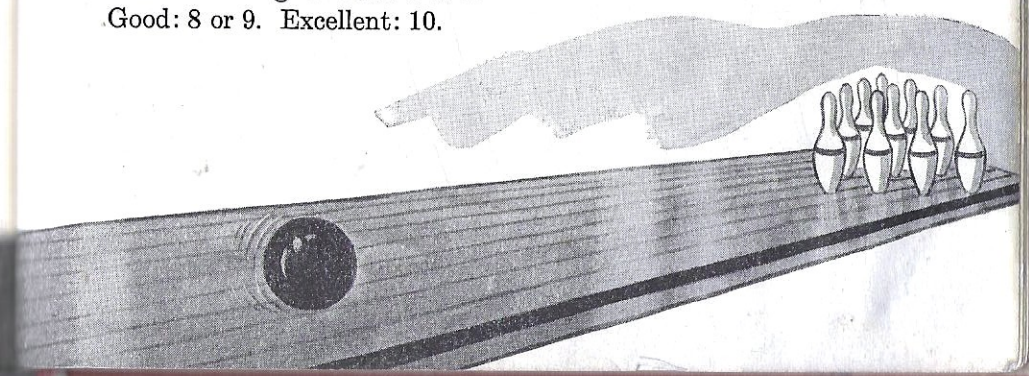
7. How much will $\frac{3}{4}$ bu. of apples cost at $3.50 a bushel?

8. Find the average of $133.86, $190.50, and $152.25.

9. On a holiday there were 175 cars in line waiting to cross the river on a ferry. If the ferry can carry 16 cars on one trip, how many trips must it make to take 175 cars over?

10. It costs $.75 to take a car and passengers across the river on the ferry. How much was received from 175 cars?

Poor: 0 to 5 right. Fair: 6 or 7.
Good: 8 or 9. Excellent: 10.



If you miss more than one example in any row, turn to the Practice Pages for that row.

| | | | | | | PRACTICE PAGES |
|---|---|---|---|---|---|---|
| Add. Check the work by going over it: | | | | | | |
| 1. | $6\frac{1}{2}$ | $4\frac{2}{3}$ | $8\frac{1}{2}$ | $2\frac{1}{3}$ | $5\frac{7}{12}$ | 57, 68 |
| | $2\frac{3}{4}$ | $9\frac{2}{3}$ | $2\frac{3}{4}$ | $4\frac{1}{5}$ | $1\frac{3}{4}$ | |
| | $1\frac{5}{8}$ | $3\frac{2}{3}$ | $3\frac{5}{6}$ | $3\frac{1}{2}$ | $4\frac{1}{2}$ | |
| Subtract. Check the work by going over it: | | | | | | |
| 2. | $9\frac{7}{8}$ | 8 | $4\frac{1}{3}$ | $2\frac{3}{4}$ | $7\frac{5}{16}$ | 61, 68 |
| | $5\frac{1}{8}$ | $6\frac{2}{3}$ | $2\frac{1}{2}$ | $1\frac{1}{6}$ | $2\frac{3}{4}$ | |
| Multiply and check the work: | | | | | | |
| 3. | $\frac{3}{8} \times 64$ | $\frac{1}{5} \times 19$ | $\frac{2}{3} \times 31$ | | | 76, 77 |
| 4. | $3\frac{1}{4} \times 12$ | $2\frac{1}{2} \times 17$ | $1\frac{1}{3} \times \$1.25$ | | | 79 |
| 5. | $10 \times 3\frac{1}{2}$ | $16 \times 2\frac{1}{3}$ | $12 \times 6\frac{3}{5}$ | | | 80 |
| 6. | $\frac{3}{4} \times \frac{3}{4}$ | $\frac{1}{8} \times \frac{2}{3}$ | $\frac{1}{2} \times \frac{1}{8}$ | | | 89 |
| 7. | $\frac{2}{3} \times \frac{3}{4}$ | $\frac{15}{16} \times \frac{4}{5}$ | $\frac{3}{10} \times \frac{5}{8}$ | | | 91 |
| 8. | $6 \times \frac{5}{8}$ | $\frac{5}{12} \times \frac{8}{15}$ | $\frac{9}{10} \times \frac{5}{6}$ | | | 92 |
| 9. | $\frac{3}{4} \times 2\frac{2}{3}$ | $1\frac{1}{2} \times \frac{2}{3}$ | $6\frac{1}{4} \times 1\frac{3}{5}$ | | | 99 |
| Divide and check the work: | | | | | | |
| 10. | $6 \div \frac{1}{2}$ | $9 \div \frac{1}{5}$ | $8 \div \frac{1}{3}$ | | | 160 |
| 11. | $5 \div \frac{2}{3}$ | $6 \div \frac{3}{4}$ | $9 \div \frac{3}{8}$ | | | 161 |
| 12. | $\frac{3}{8} \div \frac{1}{2}$ | $\frac{9}{10} \div \frac{3}{5}$ | $\frac{7}{8} \div \frac{5}{6}$ | | | 162, 163 |
| 13. | $3\frac{3}{4} \div \frac{3}{8}$ | $1\frac{1}{8} \div \frac{9}{16}$ | $4\frac{1}{2} \div \frac{3}{5}$ | | | 162, 163 |
| 14. | $\frac{7}{8} \div 2$ | $1\frac{1}{4} \div 10$ | $2\frac{5}{8} \div 14$ | | | 168 |
| 15. | $8 \div 2\frac{2}{3}$ | $\frac{5}{6} \div 1\frac{7}{8}$ | $\frac{11}{12} \div 1\frac{5}{6}$ | | | 170, 171 |
| 16. | $1\frac{7}{8} \div 3\frac{1}{3}$ | $8\frac{1}{4} \div 1\frac{5}{6}$ | $4\frac{1}{5} \div 3\frac{3}{10}$ | | | 170, 171 |

Diagnostic test.



If you miss more than one example in any row, turn to the Practice Pages for that row.

| | | | | | PRACTICE PAGES |
|---|---|---|---|---|---|
| Tell which decimal is larger: | | | | | |
| 1. | .6 or .06 | .7 or .63 | .26 or .325 | | 124 |
| Change to fractions: | | | | | |
| 2. | .11 | .50 | .08 | .029 | 130 |
| Change to decimals: | | | | | |
| 3. | $\frac{3}{4}$ | $\frac{5}{8}$ | $\frac{7}{20}$ | $\frac{9}{25}$ | 209 |
| 4. | 12% | 15% | 4% | 75% | 271 |
| Multiply and check the work: | | | | | |
| 5. | 2.86 | 120 | .05 | 21.6 | 140–145 |
| | 13 | .07 | .3 | .17 | |
| Divide. If the quotient is not exact, find the answer correct to the nearest tenth: | | | | | |
| 6. | $.6\overline{)2.7}$ | $.25\overline{).35}$ | $.02\overline{).136}$ | $6.3\overline{)31.5}$ | 220 |
| 7. | $.2\overline{).014}$ | $.07\overline{)8.4}$ | $.16\overline{)64}$ | $5\overline{).135}$ | 227 |
| 8. | $9\overline{)37}$ | $6\overline{)28}$ | $7\overline{)11.5}$ | $11\overline{)90.8}$ | 207 |
| Find these per cents. In ex. 12, find the answers to the nearest cent: | | | | | |
| 9. | 2% of \$50 | 6% of \$60 | 1% of \$80 | | 272 |
| 10. | 16% of 75 | 28% of 50 | 30% of 90 | | 272 |
| 11. | 25% of 36 | 50% of 32 | 75% of 88 | | 278 |
| 12. | 6% of \$2.30 | 75% of \$.50 | 11% of \$.80 | | 280 |

Diagnostic test.

If you can do the exercises on this page with few or no mistakes, you are ready for the next grade.

1. Say the answers to all the number facts on pages 6, 9, and 16 of this book. Then use the facts on page 6 as multiplication facts and say the answers.

Find the answers. Watch the signs:

| | | |
|---|---|---|
| 2. $267 \times 3095$ | $4800.7 - 93.8$ | $\frac{3}{4} \times 15$ |
| 3. $12{,}275 \div 25$ | $60{,}000 \div 288$ | $\frac{2}{3} \div 10$ |
| 4. $2\frac{1}{2} + \frac{7}{8} + 1\frac{3}{4}$ | $.38 + .97 + 1.54$ | $10 \div 4$ |
| 5. $47.3 \times 9.07$ | $3\frac{3}{4} + 10\frac{1}{6} + 8\frac{2}{3}$ | $9\frac{1}{2} - 1\frac{5}{6}$ |
| 6. $3.126 \div .06$ | $1.5 + 3.75 + 1.125$ | $1\frac{7}{8} \div \frac{1}{2}$ |

Put the right number in each space:

| | |
|---|---|
| 7. 24 oz. = . . . lb. | 2 yd. 15 in. = . . . in. |
| 8. $1\frac{1}{2}$ mi. = . . . ft. | 2 sq. yd. = . . . sq. ft. |
| 9. 24 in. = . . . yd. | 1 cu. yd. = . . . cu. ft. |
| 10. 2 ton = . . . lb. | 2 hr. 10 min. = . . . min. |

Find the answers:

11. At 2 oz. of candy for 5¢, find the cost of 1 lb. of candy; of $1\frac{1}{2}$ lb.; of $1\frac{3}{4}$ lb.

12. Which box holds more, one that is 2 in. × 2 in. × 5 in. or one that is 1 in. × 3 in. × 6 in.?

13. Mr. Wilson drove 133 mi. in $3\frac{1}{2}$ hr. Find the average rate per hour at which Mr. Wilson drove his car.

14. Find the average of 2286, 2309, 2275, and 2294.

15. Jack walked 3 times around a block that is 200 ft. wide and 240 ft. long. What part of a mile did he walk?

Promotion test.



### Linear Measure

12 inches (in.) = 1 foot (ft.)
3 feet = 1 yard (yd.)
$5\frac{1}{2}$ yards or $16\frac{1}{2}$ feet = 1 rod (rd.)
320 rods or 5280 feet = 1 mile (mi.)

### Square Measure

144 square inches (sq. in.) = 1 square foot (sq. ft.)
9 square feet = 1 square yard (sq. yd.)
$30\frac{1}{4}$ square yards = 1 square rod (sq. rd.)
43,560 square feet = 1 acre (A.)
160 square rods = 1 acre
640 acres = 1 square mile (sq. mi.)

### Cubic Measure

1728 cubic inches (cu. in.) = 1 cubic foot (cu. ft.)
27 cubic feet = 1 cubic yard (cu. yd.)

### Measures of Weight

16 ounces (oz.) = 1 pound (lb.)
100 pounds = 1 hundredweight (cwt.)
2000 pounds = 1 ton (T.)

### Measures of Time

60 seconds = 1 minute
60 minutes = 1 hour (hr.)
24 hours = 1 day (da.)
7 days = 1 week (wk.)

12 months = 1 year (yr.)
365 days = 1 year
366 days = 1 leap year
100 years = 1 century

### Liquid Measure

2 cups = 1 pint (pt.)
2 pints = 1 quart (qt.)
4 quarts = 1 gallon (gal.)

### Dry Measure

2 pints = 1 quart (qt.)
8 quarts = 1 peck (pk.)
4 pecks = 1 bushel (bu.)

# THE 100 MULTIPLICATION FACTS

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 0 | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 |
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 0 | 3 | 6 | 9 | 12 | 15 | 18 | 21 | 24 | 27 |
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| 0 | 4 | 8 | 12 | 16 | 20 | 24 | 28 | 32 | 36 |
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 |
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| 0 | 6 | 12 | 18 | 24 | 30 | 36 | 42 | 48 | 54 |
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 |
| 0 | 7 | 14 | 21 | 28 | 35 | 42 | 49 | 56 | 63 |
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| 0 | 8 | 16 | 24 | 32 | 40 | 48 | 56 | 64 | 72 |
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 |
| 0 | 9 | 18 | 27 | 36 | 45 | 54 | 63 | 72 | 81 |

# THE 90 DIVISION FACTS

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| $1\overline{)1}$ = 1 | $1\overline{)2}$ = 2 | $1\overline{)3}$ = 3 | $1\overline{)4}$ = 4 | $1\overline{)5}$ = 5 | $1\overline{)6}$ = 6 | $1\overline{)7}$ = 7 | $1\overline{)8}$ = 8 | $1\overline{)9}$ = 9 |
| $2\overline{)2}$ = 1 | $2\overline{)4}$ = 2 | $2\overline{)6}$ = 3 | $2\overline{)8}$ = 4 | $2\overline{)10}$ = 5 | $2\overline{)12}$ = 6 | $2\overline{)14}$ = 7 | $2\overline{)16}$ = 8 | $2\overline{)18}$ = 9 |
| $3\overline{)3}$ = 1 | $3\overline{)6}$ = 2 | $3\overline{)9}$ = 3 | $3\overline{)12}$ = 4 | $3\overline{)15}$ = 5 | $3\overline{)18}$ = 6 | $3\overline{)21}$ = 7 | $3\overline{)24}$ = 8 | $3\overline{)27}$ = 9 |
| $4\overline{)4}$ = 1 | $4\overline{)8}$ = 2 | $4\overline{)12}$ = 3 | $4\overline{)16}$ = 4 | $4\overline{)20}$ = 5 | $4\overline{)24}$ = 6 | $4\overline{)28}$ = 7 | $4\overline{)32}$ = 8 | $4\overline{)36}$ = 9 |
| $5\overline{)5}$ = 1 | $5\overline{)10}$ = 2 | $5\overline{)15}$ = 3 | $5\overline{)20}$ = 4 | $5\overline{)25}$ = 5 | $5\overline{)30}$ = 6 | $5\overline{)35}$ = 7 | $5\overline{)40}$ = 8 | $5\overline{)45}$ = 9 |
| $6\overline{)6}$ = 1 | $6\overline{)12}$ = 2 | $6\overline{)18}$ = 3 | $6\overline{)24}$ = 4 | $6\overline{)30}$ = 5 | $6\overline{)36}$ = 6 | $6\overline{)42}$ = 7 | $6\overline{)48}$ = 8 | $6\overline{)54}$ = 9 |
| $7\overline{)7}$ = 1 | $7\overline{)14}$ = 2 | $7\overline{)21}$ = 3 | $7\overline{)28}$ = 4 | $7\overline{)35}$ = 5 | $7\overline{)42}$ = 6 | $7\overline{)49}$ = 7 | $7\overline{)56}$ = 8 | $7\overline{)63}$ = 9 |
| $8\overline{)8}$ = 1 | $8\overline{)16}$ = 2 | $8\overline{)24}$ = 3 | $8\overline{)32}$ = 4 | $8\overline{)40}$ = 5 | $8\overline{)48}$ = 6 | $8\overline{)56}$ = 7 | $8\overline{)64}$ = 8 | $8\overline{)72}$ = 9 |
| $9\overline{)9}$ = 1 | $9\overline{)18}$ = 2 | $9\overline{)27}$ = 3 | $9\overline{)36}$ = 4 | $9\overline{)45}$ = 5 | $9\overline{)54}$ = 6 | $9\overline{)63}$ = 7 | $9\overline{)72}$ = 8 | $9\overline{)81}$ = 9 |
| $1\overline{)0}$ = 0 | $2\overline{)0}$ = 0 | $3\overline{)0}$ = 0 | $4\overline{)0}$ = 0 | $5\overline{)0}$ = 0 | $6\overline{)0}$ = 0 | $7\overline{)0}$ = 0 | $8\overline{)0}$ = 0 | $9\overline{)0}$ = 0 |

## SCORING TABLE FOR IMPROVEMENT TESTS

| NUMBER OF EXAMPLES IN TEST | NUMBER OF EXAMPLES RIGHT | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| 4 | 0 | 3 | 5 | 8 | 10 | | | | | | | | | | | |
| 5 | 0 | 2 | 4 | 6 | 8 | 10 | | | | | | | | | | |
| 6 | 0 | 2 | 3 | 5 | 7 | 8 | 10 | | | | | | | | | |
| 7 | 0 | 1 | 3 | 4 | 6 | 7 | 9 | 10 | | | | | | | | |
| 8 | 0 | 1 | 3 | 4 | 5 | 6 | 8 | 9 | 10 | | | | | | | |
| 9 | 0 | 1 | 2 | 3 | 4 | 6 | 7 | 8 | 9 | 10 | | | | | | |
| 10 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | | | | | |
| 12 | 0 | 1 | 2 | 3 | 3 | 4 | 5 | 6 | 7 | 8 | 8 | 9 | 10 | | | |
| 15 | 0 | 1 | 1 | 2 | 3 | 3 | 4 | 5 | 5 | 6 | 7 | 7 | 8 | 9 | 9 | 10 |

For directions for using this table, see page **51.**

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